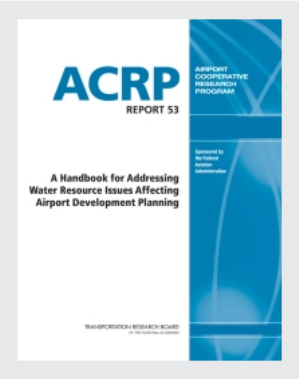

A Handbook for Addressing Water Resource Issues Affecting Airport Development Planning

DETAILS

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Transportation Research Board

AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 53

A Handbook for Addressing Water Resource Issues Affecting Airport Development Planning

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

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The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), and the Air Transport Association (ATA) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

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FOREWORD

By Lawrence D. Goldstein
Staff Officer
Transportation Research Board

ACRP Report 53 is a handbook that identifies appropriate responses to a variety of water resource issues affecting airport planning and development. The handbook includes options for setting up a water resource management program and outlines the steps necessary to implement that program in response to local conditions. The handbook also presents strategies for including water resource planning and management as part of a broader life-cycle planning and development process. Specific worksheets are included on the regulatory framework guiding water resource management along with a set of fact sheets for defining and categorizing a broad set of water resource issues and appropriate responses. Finally, the handbook provides an overview of National Environmental Policy Act (NEPA) procedures that control environmental reviews affecting airport development. The contractor's final report summarizes the research approach used to generate the handbook and is available on the TRB website at http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2574.

The handbook will be of particular interest to those involved in the earliest stages of planning for airport development projects, including airport planners, design engineers, and environmental compliance personnel. It can also be used as a guide for managing response to water resource issues throughout the project development and implementation process—from initial planning to operation of the constructed system. The handbook provides summaries of key information for those particularly interested in an overview of the subject matter as well as a significant level of detail for those that are actually involved in managing water resource issues on a daily basis. It also includes many tips and insights gleaned from experience on actual projects.

As air travel demand increases, many airports are faced with the need to enhance capacity; but planning for increased capacity often brings with it a challenge of balancing business concerns and environmental protection. Enhanced capacity can provide environmental benefits by helping to eliminate congestion in the air and on the ground. Implementing those capacity improvements, however, must address environmental "costs" as well, including potential impacts on water resources. Failure to address possible water resource issues effectively and obtain necessary permits and approvals in a timely fashion can result in significant project delays.

Recognizing the growing need to address complex environmental issues and their effect on airport development planning, *ACRP Report 53* has been designed to help airport planners and operators better understand the wide range of water resource issues facing airports and how these issues can affect the timeliness of project approvals, real project costs, and implementation of proposed projects or programs. Simultaneous consideration of potential water resource constraints along with planning airport capacity

enhancement projects will benefit the entire aviation system. Therefore, airport operators and planners need guidance in recognizing and responding to potential impacts that capacity enhancement activities may have on water resources. A concern that often prevents early integration is the need to allocate sufficient funds for identifying water resource issues before the project is underway. The decision to allocate funds is essentially risk-based. Failure to characterize water resource issues adequately can result in a series of problems and delays that has the potential to cost more than the initial investment in water resource issue characterization.

CONTENTS

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

SECTION 1

Handbook Overview

1.1 Introduction and Background

As the aviation industry evolves in response to societal changes including air travel demand, continued implementation of airport development projects is a virtual certainty. Airport development projects are undertaken for a wide variety of reasons, ranging from the replacement of aging infrastructure to the need for additional capacity. Implementing an airport development project can be a complex exercise that, in some cases, takes many years and costs hundreds of millions of dollars. The exercise can involve many stakeholders, both internal and external to the airport organization.

During implementation of a development project, project planners and project managers must balance a multitude of considerations:

- Costs, revenue, and funding;
- Project capacity and functionality;
- Regulatory compliance;
- Sequence and schedule;
- Airport policies and operations; and
- Stakeholder concerns and objectives.

The timing and extent to which the issues associated with each consideration are assessed can have a profound impact on meeting the project's objectives.

Some of the more crucial and complex aspects of a project that stakeholders must consider are the issues associated with managing water resources that are potentially impacted by the development project. The need to manage "water resource issues" is created when airport stakeholders identify potential water resource impacts and determine the regulatory requirements associated with those impacts.

This Handbook examines the potential consequences of insufficiently addressing water resource issues and provides guidance for managing these issues:

- Greater overall project cost,
- Missed schedule milestones,
- Changes to project functionality,
- Compromised airport operations, and
- Greater compliance risk.

The guidance is designed to facilitate the management of water resource issues within the context of the development project implementation process.

Managing water resource issues for a development project is ultimately a site-specific exercise. Still, there are many commonalities in managing various types of water resource issues across the

industry that can be synthesized to provide guidance for individual projects. The approach described in this Handbook is derived from the experiences of multiple types of stakeholders in managing water resource issues at airports across the aviation industry. It provides guidance based on commonalities in approaches to individual projects that can form a framework for addressing site-specific issues. The Handbook approach is designed to facilitate sound decisionmaking based on reliable information, as well as effective coordination between management of water resource issues and management of the development project throughout the life-cycle of the project.

To be most effective, the foundation for decisionmaking and coordination must be established at the earliest stages of the project planning process. A principal objective of early planning is to identify project alternatives that avoid water resource impacts. If avoidance is incompatible with project objectives and resources, early planning will facilitate identification of project alternatives that minimize impacts to water resources while still meeting project objectives.

Keys to Reducing Negative Consequences of Insufficient Water Resource Management in Development Projects

- Recognizing the importance of managing water resource issues
- Early planning to identify project alternatives with minimal impact on water resources
- Employing a structured approach to coordinating project and water resource management throughout project life-cycle
- Considering input from stakeholders on the right issues at the right time

Early planning provides an essential baseline for improving the effectiveness of identifying, understanding, communicating, coordinating, and ultimately finding solutions for water resource issues that are satisfactory to the various project stakeholders. Deferring sufficient consideration of water resource issues until late in the process creates a cascade of project management problems, including project regulatory processing and implementation delays. A more structured approach facilitates an early exchange of crucial information between personnel managing water resource issues and those managing the larger development project planning and implementation. This type of approach can lead to better decisionmaking and fewer unexpected project effects.

The Handbook considers this situation through the lens of seven different categories of water resource issues:

1. Physical impacts to wetlands and other surface waters,
2. Surface water and groundwater quality,
3. Storm water quantity and floodplains,
4. Hazardous wildlife attractants,
5. Aquatic life and habitat,
6. Coastal zones and barriers, and
7. Wild and scenic rivers.

Assessment of water resource issue management by examining individual categories of issues allows commonalities and important differences to be identified. Effectively synthesizing management of those issues with the overall project management can reduce the risk of long-term impacts to the development project and provide for more efficient project implementation.

1.2 Handbook Objectives

The Handbook provides guidance to stakeholders involved in development project planning and to those responsible for management of the associated water resource issues. The Handbook content is drawn from industry experience, existing reference documents, case studies, and consideration of techniques that can improve the effectiveness of water resource issue management in development project implementation.

The overarching objective of the Handbook is to facilitate implementation of development projects in a way that protects water resources while minimizing the effects of water resource issue management on the project function, schedule, and costs and on airport operations. To support this objective, the Handbook promotes consideration of these issues through the structure of a Water Resource Issue Management Program (Program). An individual airport's Program will facilitate the early collection of baseline information needed to support decisionmaking and the development of methodologies needed for decisionmaking as issues are identified on individual projects. The approach promotes a "cradle to grave" strategy for integrating the management of water resource issues into the development project implementation process. The strategy is applicable from initial conceptualization of the project through completion of construction and startup of the project's operations.

Handbook's Value in Managing Water Resources in Development Project Implementation

- Guidance for developing a planning structure
- Information to increase understanding of issues
- Tips for more effective management of the issues
- Common frame of reference for project stakeholders

The Handbook is not intended to be a comprehensive reference for all potentially applicable water resource regulations. The number of regulations, complexity of individual regulations, site or state-specific nature of permitting, and ongoing evolution of the regulatory environment limits the practicality of presenting a comprehensive review of potentially applicable regulations. As such, the regulatory material presented in the Handbook is not suitable as a substitute for actual review of the regulations. Appropriately qualified personnel will need to specifically identify and review the regulations applicable to their project to fully assess compliance requirements.

The potential stakeholders involved in water resource issues and the project implementation process are

- Various airport departments,
- Airlines,
- Airport tenants,
- Regulators/government officials,
- Consultants,
- Construction contractors,
- Interest groups, and
- The public.

Use of the Handbook can provide value to both individual project stakeholders and to the project team as a whole. As with any project, stakeholders will have some common objectives and some objectives specific to their own needs. It is hoped that use of the Handbook will provide a focal point for a structure, process, and language through which stakeholder needs and objectives can be better communicated such that overall project objectives can be more effectively met. To that end, the primary guiding principles found in the Handbook and recommended to stakeholders are described in the box following.

Guidance Principles for Management of Water Resource Issues in Airport Development Projects

- **Using a Water Resource Issue Management Program** provides a management structure for water resource issues on all airport development projects.
- **Using a Water Resource Issue Information Catalog** provides a common baseline of airport-specific, water resource–related information.

- **Recognizing that the management of water resource issues and development project implementation is a "cradle to grave" process** is important. An ongoing, iterative exchange of information between water resource issues and development project management reduces the likelihood of significant disruptions to project schedule and design.
- **Understanding project-specific water resource issues and regulatory requirements** and consulting with environmental specialists having experience in those issues and regulations early in the process is an effective means to reduce negative effects on development project function, schedule, and cost.
- **Making an early assessment of water resource issues will require allocation of funds earlier in the project** implementation process. Comparing the costs of early water resource issue assessment to the financial and operational risks of not addressing water resource issues until later in the project implementation process is advised.
- **Tailoring an airport's Water Resource Issue Management Program to site-specific considerations,** protocols, and available resources within the over-all Program framework is best. The site-specific nature of water resources, development project impacts, and water resource regulatory requirements do not lend themselves to a one-size-fits-all approach to water resource issue management.
- **Establishing early in the process a common understanding among stakeholders as to the approach, protocols, roles, terminology, and communication methods to be used** in assessing water resource issue management and development project implementation is important. Perspectives will likely vary significantly among stakeholders on development project implementation and water resource issue management priorities and processes.
- **Deciding whether to complete permitting for individual water resource issues** inside or outside the National Environmental Policy Act (NEPA) process timeline is an important scheduling factor. Establishing the factors driving the decision, and coordinating with stakeholders on that decision is crucial.

1.2.1 Handbook Structure

The Handbook is structured as follows:

1. **Guidance Summary.** Section 1.3 summarizes the key elements presented in the Handbook and its appendices. This summary may be particularly applicable to those interested in planning-level guidance on integrating development project implementation and water resource issue management.
2. **Water Resource Issue Management Program Implementation.** Section 2 provides detailed guidance on establishing a Water Resource Issue Management Program to provide baseline information and guiding protocols for addressing water resource issues in development project implementation.
3. **Integration Strategies.** Section 3 provides detailed guidance on specific methods and strategies for integrating the management of water resource issues and development project implementation through the life-cycle of the development project.

4. **Supplementary Worksheets.** Documentation of the findings of the planning process is important. To help illustrate how key information collected early in the planning process can be documented, four example worksheets have been included in Appendix A:
   - Worksheet 1: Project Roles and Responsibilities
   - Worksheet 2: Project Characteristics and Water Resource Effects
   - Worksheet 3: Summary of Water Resource Inventory Information for Potential Site 1
   - Worksheet 4: Summary of Applicable Core Regulatory Requirements
5. **Water Resource Issue Fact Sheets.** Fact sheets are provided in Appendix B for the following seven individual water resource issue categories:
   - Fact Sheet 1: Physical Impacts to Wetlands and Other Surface Waters
   - Fact Sheet 2: Surface Water and Groundwater Quality
   - Fact Sheet 3: Storm Water Quantity and Floodplains
   - Fact Sheet 4: Hazardous Wildlife Attractants
   - Fact Sheet 5: Aquatic Life and Habitat
   - Fact Sheet 6: Coastal Zones and Barriers
   - Fact Sheet 7: Wild and Scenic Rivers
6. **Overview of the NEPA Process.** Appendix C provides an overview of the NEPA process and guidance on coordinating this process with airport development planning and the management of water resource issues.

1.2.2 Handbook Use

The guidance provided in the Handbook is not intended to be a form-fitting procedure for water resource issue management at every airport for every development project; it is intended to provide structure, ideas, tips from the experience of others, and concepts that can be adapted by staff at individual airports of all sizes in ways that fit their organizational needs. Full implementation of the Water Resource Issue Management Program and methods identified in the Handbook—adapted to an individual airport's needs—may be a valuable tool for some facilities. In other cases, airport operators and other stakeholders may simply identify insights from the Handbook for use on specific projects.

This section has been developed to provide users with guidance on general use of the Handbook as they craft their site-specific means of managing water resource issues in development projects. General tips on use of the Handbook are found in the adjacent inset.

How to Use the Handbook

1. Review basic elements of recommended approach in Figure 1 and Table 1 (see end of Section 1.2.2).
2. Determine elements of recommended approach that will be used on the project.
3. Use material in Section 2 for guidance in establishing the Water Resource Issue Management Program prior to project planning.
4. Use the worksheets in Appendix A for examples of how to document key findings.
5. Use Fact Sheets in Appendix B to assist in understanding and approaching individual water resource issue categories.
6. Use NEPA guidance in Appendix C to assist in determining the relationship between the project development, compliance with individual regulatory issues, and NEPA compliance.

7. Review the information in Section 3 to provide guidance on the process of integrating water resource issue management and development project management at the various project implementation phases.

Guidance on use of the example worksheets found in Appendix A is shown in the corresponding inset. The worksheets are intended to provide example tables for how to track key information on the development project and water resource issues. It is envisioned that airport and project-specific worksheets could be passed along to stakeholders as a means of communicating key issues and facilitating decisionmaking.

How to Use Worksheets to Support Project Documentation

1. Review example worksheets in Appendix A.
2. Create site or project-specific template using worksheet structure as basis.
3. Document key information as process progresses on worksheet.
4. Provide worksheets to project stakeholders to aid information exchange.

Guidance on the use of the Water Resource Issue Fact Sheets in Appendix B is found in the corresponding inset. The fact sheets in Appendix B are designed to provide information and guidance on specific issues. The level of detail in Appendix B should be useful to anyone seeking an in-depth understanding of particular issues. For those more interested in an overview, important information from the fact sheets is summarized in Section 1.3.4.

How to Use Fact Sheets for Individual Water Resource Issue Categories

1. Obtain an overview of the category.
2. Identify potentially applicable laws and regulations.
3. Seek guidance on procedures for managing the water resource issue.
4. Extract tips for dealing with specific aspects of the water resource issue.

How to Use NEPA Guidance

1. Review Appendix C.
2. Coordinate information in Appendix C with other sources of NEPA guidance.
3. Look to NEPA guidance as specific issues come up during project.

How to use the NEPA guidance provided in Appendix C is found in the corresponding inset. The guidance is intended as a supplement to other available NEPA guidance including the FAA's *Environmental Desk Reference for Airport Actions* (*1*). The guidance in Appendix C focuses on interaction of the NEPA process with the development planning process and the compliance process for regulatory requirements associated with individual water resource issues.

Figure 1 and Table 1 provide a means of linking the recommended sequence of planning and management activities to their referenced locations in the Handbook. Figure 1 illustrates the sequence of activities that form the core of the approach recommended in the Handbook. Table 1 identifies the locations within the Handbook and appendices where relevant information on the main recommended activities can be found.

How to Use Figure 1

1. Review the five primary activities in the process outlined in Figure 1 prior to the start of development project planning.
2. Compare the primary activities in the recommended process to those used at the facility.
3. Review the support activities associated with each of the five primary activities. Identify the activities that may be executed, and align the support activities with the primary activities for the airport's process.
4. Reference Table 1.

How to Use Table 1

1. From Figure 1, identify the primary and support activities that the airport and project will implement.
2. Refer to Table 1 to find the specific parts of the Handbook to consult for guidance.
3. Review the referenced sections of the Handbook.

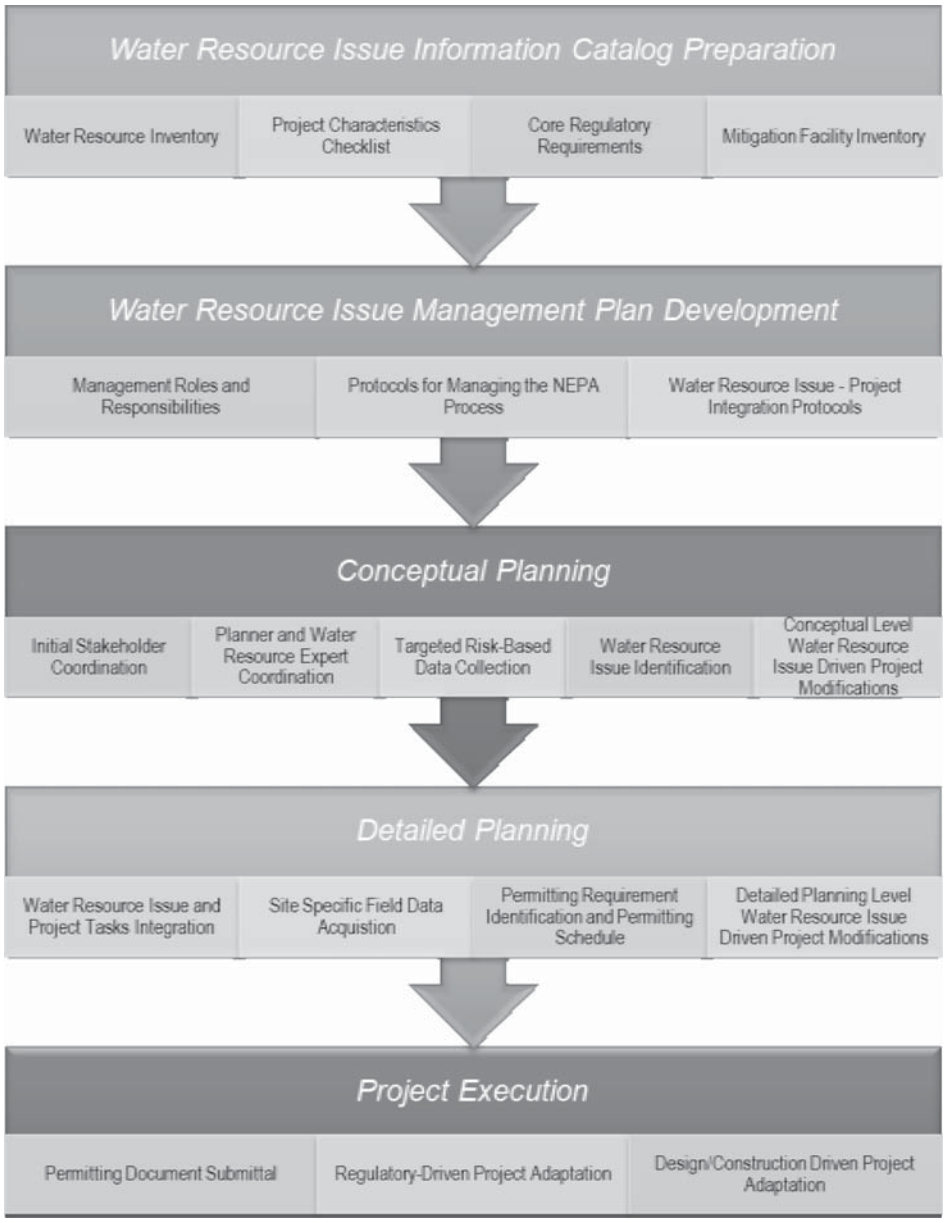

Figure 1. Primary and support activities recommended for managing water resource issues on airport development projects.

Table 1. Sections associated with each recommended water resource issue management step.

Step	Primary Activity	Support Activities	Handbook Reference	Worksheet Reference
1	Review Summary of Handbook Guidance	Become familiar with recommended guidance	Section 1.3.4	
2	Prepare Water Resource Issue Information Catalog (Ideally, catalog is completed for entire airport for use on multiple projects, but it can be project-specific.)	Develop Water Resource Inventory for the airport	Section 2.2.2 Appendix B Fact Sheets	
		Prepare Mitigation Facility Inventory for the airport	Section 2.2.3 Appendix B Fact Sheets	
		Review project characteristics typical of the airport's projects	Section 2.2.4	
		Determine core regulatory requirements for the airport	Section 2.2.5 Appendix B Fact Sheets	Worksheet 4
3	Develop Water Resource Issue Management Plan for the Project	Document project-specific roles and responsibilities	Section 2.3.1	Worksheet 1
		Update Water Resource Inventory for project site(s)	Section 2.2.2 Appendix B Fact Sheets	
		Update Mitigation Facility Inventory	Section 2.2.3 Appendix B Fact Sheets	
		Define key project characteristics for the site that might affect water resources	Section 2.2.4 Appendix B Fact Sheets	Worksheet 2
		Eliminate from consideration water resources at sites that will not be affected	Section 2.2.4 Appendix B Fact Sheets	Worksheet 3
		Assess and decide upon protocols for managing the NEPA process for water resource issues that need to be considered	Section 2.3.2 Appendix C NEPA Guide	
		Define the protocols for managing the integrated assessment of water resource issues and project implementation	Section 2.3.3 Appendix B Fact Sheets	
4	Perform Activities Associated with Conceptual Planning	Target data collection based on initial cost and project risk	Section 2.2.2	
		Identify and characterize specific water resource issues on sites	Section 3.3	
		Determine project alternatives and consider water resource issue impacts	Section 3.3	
		Determine Approach to NEPA on the Project	Appendix C NEPA Guide	
5	Perform Activities Associated with Detailed Planning	Identify permit and permit schedule needs for specific water resource issues	Section 3.4	
		Acquire site-specific field data to support permitting and design	Section 3.4	
		Develop mitigation and control alternatives	Section 3.4	
		Complete NEPA documentation	Appendix C NEPA Guide	
		Adapt project based on data acquisition and analysis	Section 3.4	
6	Perform Activities Associated with Project Execution	Reassess water resource issues based on detailed siting and design analyses	Section 3.5	
		Complete permit applications for individual water resource issues	Section 3.5	
		Modify project as necessary based on regulatory approval and feedback	Section 3.5	

1.3 Summary of Handbook Guidance

1.3.1 Overview of Guidance to Planners

One of the key stakeholder groups in the management of water resource issues in the project implementation process is the leaders in the planning of the development project. The roles and responsibilities of the personnel involved in the development project planning process can vary widely from one airport to another. The degree to which these individuals are involved with and/or knowledgeable of the details of water resource issue management can also vary widely. For those who are seeking a greater understanding of the key recommended actions found in the Handbook and for those who do not have the opportunity for a detailed review of the Handbook, an overview of the recommended actions is provided below.

Overview of Recommended Actions for Planning Personnel

Planners should consider the following actions to promote a more effective management of water resource issues in the development project implementation process.

1. Prior to conceptual planning:
   - Define, with the project management team, the responsibilities and protocols for coordinating information exchange among planners, environmental specialists, and other stakeholders;
   - Request information from environmental compliance specialists that defines existing water resources on the site and potentially applicable regulations; and
   - In consultation with environmental compliance specialists, define the timing and protocols for managing the NEPA process and the process of obtaining permits for individual water resource impacts.
2. During the initial conceptual project layout and identification of potential sites:
   - Ask environmental compliance specialists to identify potential water resource issues for the selected sites;
   - Coordinate with environmental compliance specialists to identify opportunities to avoid water resource impacts;
   - Coordinate with environmental compliance specialists to develop conceptual alternatives for minimizing water resource impacts where impacts cannot be avoided; and
   - Facilitate documentation of alternatives for avoiding and minimizing water resource impacts to support NEPA and other project needs.
3. Following identification of potential project alternative(s):
   - Ask environmental and engineering staff to define controls that may be needed to achieve compliance with applicable laws and regulations;
   - Coordinate with environmental and engineering staff to determine whether implementation of compliance controls and mitigation measures might affect project; and
   - Ask environmental compliance specialists to define the schedule for preparing and obtaining permits for impacts to water resources.
4. Following selection of project alternative:
   - Coordinate with engineering, construction, operations, and environmental compliance departments to see that information exchange between project implementation and water resource issue management continues through project life-cycle.

1.3.2 Overview of Recommended Airport-Specific Water Resource Issue Management Program

As will be discussed in detail in Section 2, effectively planning for water resource issues associated with development projects can be aided by establishing an airport-specific Water Resource Issue Management Program that provides a structure to the information assessment and compliance assessment process. The Water Resource Issue Management Program proposed in the Handbook includes the following components:

1. Water Resource Issue Information Catalog—
   - Water Resource Inventory,
   - Mitigation Facility Inventory,
   - Core Regulatory Requirements, and
   - Development Project Checklist.
2. Water Resource Issue Management Plan—
   - Management Roles and Responsibilities,
   - Protocols for Managing the NEPA Process, and
   - Protocols for Integrating Water Resource Issue Management and Development Project Implementation.

Key Notes

Ideally, baseline information on site water resources and the general approach to water resource issue management would be available to planners prior to the start of the planning process.

The Water Resource Issue Information Catalog provides a common baseline of information from which assessment of water resource issues on all projects can proceed. The catalog should ideally be developed in advance of the planning process for a specific project so that the information is available at the earliest stages of planning. This will allow more informed consideration of water resource issues at a point in the planning process where water resource impacts can be most easily avoided.

The Water Resource Issue Management Plan establishes the guiding principles, management structure, methods, and strategies that will be used to execute the management of water resource issues within the context of a development project.

The initial development of the catalog and plan will result in water resource information and a project execution framework that can be used on any development project at the airport with potential water resource issues. While there will be an initial investment to develop these items, there should be long-term cost reductions achieved by implementing the Program through:

- Decreases in schedule impacts associated with insufficient and late assessment of water resource issues;
- Reductions in duplicate efforts in acquiring information and in assessing potential sites for multiple projects;
- Reductions in planning, design, and construction expenses through a more integrated consideration of water resource issue management and development project planning; and
- Reductions in the risk of noncompliance with regulatory requirements.

1.3.3 Overview of Guidance on Integrated Life-Cycle Management of Water Resource Issues Within the Project Implementation Process

In Section 3, a method for a life-cycle-based strategy of managing the interaction between water resource issue management and development project implementation is proposed. For the purposes of the Handbook, "life-cycle" incorporates actions taken between the "initial assessment" of the project concept to the "operational startup" period for the project that has been

implemented. The definitions of "initial assessment" and "operational startup" can clearly be project and site-specific. In general, however, the following definitions apply:

- **Initial assessment**—any activities that are associated with consideration of the concepts and locations for the development project. This includes activities undertaken to characterize water resources before they are considered in the context of a specific project.
- **Operational startup**—a period of time after construction is completed in which the desired operational activities associated with the project are occurring. Operational startup could include such varied factors as flight activities on a new runway, process operations for a treatment facility, or maintenance activities associated with a mitigation wetland. It is important to consider this operational period during the planning stages since the compliance risk, costs, and revenue projections associated with operations can have a crucial impact on decisionmaking for some projects.

Between the initial assessment and operational startup, a project can have a variety of phases. In this Handbook, the project life-cycle is divided into three broad phases: conceptual planning, detailed planning, and project execution. At many airports, conceptual planning would encompass the master planning process; detailed planning is work associated with a specific project. Project execution encompasses the post-planning activities of detailed design, bidding, construction, and operational startup.

Typical Phases in Water Resource Issue/ Project Implementation Process

- Conceptual Planning (one or more projects; includes master plans)
- Detailed Planning (individual project)
- Project Execution (design, construction, operation)

The essence of the proposed life-cycle approach is that managing the interaction of water resource issue and project implementation is an iterative process in which information is continually exchanged and management strategies are continually adapted. Four main elements of that iterative process tend to recur in each project stage: characterize water resources, define compliance requirements, assess project effects, and consolidate all effects (see Figure 2).

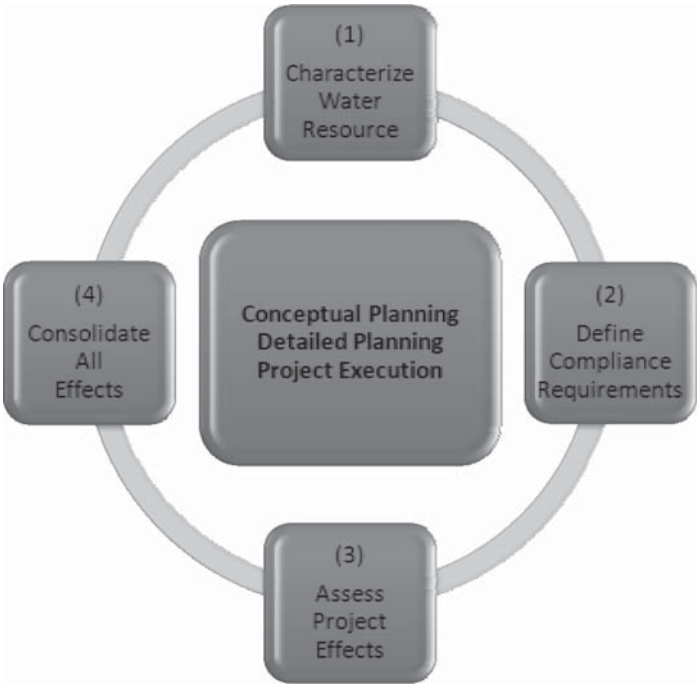

Figure 2. The four recurring activities within each of the three project implementation phases.

The objective of implementing this cyclical, iterative approach is to identify and address issues continuously throughout the project implementation process, making incremental changes as necessary to keep the project on track and on budget. Using this method should reduce the potential for unexpected, large-scale disruptions to the project schedule and lessen the likelihood of costly project design revisions late in the project.

1.3.4 Overview of Guidance in Water Resource Issue Fact Sheets

Appendix B contains a series of fact sheets on seven water resource issue categories. The categorization was derived primarily from similarities in impacts from development projects, similarities in the measures that are typically taken to mitigate for impacts to the water resources, and commonalities in the regulatory requirements. It is important for planners and development project management to understand that project impacts must be understood, even in early planning stages, from the standpoint of the individual water resource issues. Each issue may have its own unique set of regulatory requirements, and compliance with those requirements may have its own unique effect on the project—for example, the presence of wetlands on a potential development site can affect the ability to site that project. On the other hand, water quality-based impacts may have relatively little effect on the ability to site a project at the desired location, but could require land in other locations at the airport for storm water storage and treatment.

Each fact sheet provides a detailed approach to managing the process of complying with regulatory requirements for a specific water resource issue within the context of a development project. The fact sheets include information to promote a general awareness of the issue, summary of applicable regulations, and planning considerations drawn from industry experience on management of the water resource issue within the context of development projects. The fact sheets have four sections, each designed to help readers understand a different aspect of the water resource issue management process:

1. Description of water resource issue and impacts,
2. Identification of core regulatory requirements,
3. Determination of the measures needed for compliance, and
4. Reduction of water resource issue effects on development projects.

The level of detail in each fact sheet presented in Appendix B may be most appropriate for environmental professionals or others who will be preparing materials for compliance and for the project team by providing detailed assessments of potential impacts of compliance on project design, layout, schedule, costs, and operation. To facilitate the understanding of the water resource issue for those who do not need the level of detail presented in Appendix B, a summary of key information for each water resource issue category is presented at the end of this section. The summaries focus on guidance obtained from industry experience on considerations for reducing project impacts associated with each particular water resource issue.

Water Resource Issue Fact Sheet Summaries

Summary of Fact Sheet 1: Physical Impacts to Wetlands and Other Surface Waters

Airport property may contain or be adjacent to wetlands or other surface waters. The infrastructure siting associated with new development projects often results in unavoidable potential physical impacts to these resources and/or their buffer zones. Avoidance of these impacts is the top priority. At times, for example, where land availability is limited or airport design standards require a project in a specific location, avoiding impacts is often not possible. Where impacts appear unavoidable, permits and mitigation measures are required.

Regulations have been developed to protect wetlands and other surface waters from particular physical impacts. Sections 9 and 10 of the Rivers and Harbors Act established a permit program for structures affecting or work conducted in "navigable waters." Section 404 of the Clean Water Act (CWA) established a permitting program under United States Environmental Protection Agency (USEPA) guidance for discharges of dredge or fill materials into "waters of the United States." If structures, work, or discharges of material are proposed for wetlands or other surface waters, a permit authorizing the activity may be required by the United States Army Corps of Engineers (USACE) before the activities commence. Prior to authorization of a Section 9, 10, or 404 permit, a Water Quality Certification under Section 401 of the CWA must be issued by the state to certify that the federal permit meets state water quality standards. Since federal agencies authorize Section 9, 10, and 404 permits, the requirements of NEPA apply. Typically, the USACE ensures NEPA requirements are met through the agency's internal permit approval process; however, in some situations, another federal agency (e.g., the FAA) assumes the lead regulatory agency role for the NEPA process for this type of water resource issue.

Characterizing the effects of a development project on wetlands and other surface waters requires an understanding of how the project affects the development site and an understanding of the core regulatory requirements. Federal agencies must evaluate the project, as well as ensure that options to avoid or minimize impacts to wetlands and other surface waters have been assessed. Mitigation is required as a condition for some permit authorizations when those impacts cannot be avoided.

Project planning and design considerations typically associated with physical impacts to wetlands and surface waters include the following:

- Do potential sites contain wetlands and other surface waters?
- Have those wetlands and surface waters been delineated on the site, had their quality assessed, and received a jurisdictional determination to identify the governing regulatory agency?
- Have alternatives for avoiding the wetlands and surface waters been assessed?
- Have mitigation options, their cost, and an implementation schedule been assessed during the early planning stages?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing physical impacts to wetlands and other surface water issues on the development project are presented in Fact Sheet 1 in Appendix B. A summary of the guidance for reducing those project impacts follow.

Guidance for Reducing Project Impacts from Managing Issues Associated with Physical Impacts to Wetlands and Other Surface Waters

Water Resource Inventory	Prepare water resource inventory for use on multiple projects. Identify wetland acreages and quality.

Impact Avoidance	Consider relocation of some or the entire project to avoid wetland or surface water impacts for all development projects. Having alternate sites for those projects, if feasible, may reduce delays if a change is made.
Permit Acquisition and Approval	Limit wetland and stream impacts if possible such that Nationwide Permits (NWPs) rather than individual permits can be used. This will minimize schedule impacts and reduce permitting costs.
Design Development	Consider whether changes to the development project might reduce the cost and schedule impacts for permitting.
Development Revenue	Account for gained or lost revenue from changes if project function or scope must change to achieve compliance.
Schedule and Sequencing	Recognize that schedule changes usually equate to cost increases for consultation, design, and construction.
Staffing	Identify the expertise needed, select qualified experts, and bring them in at the right time to avoid re-doing work.
Stakeholder Coordination	Seek to understand cost considerations raised by stakeholders such as airlines and various airport departments. Coordinate early with stakeholders such as airlines, regulators, various airport departments, and communities to avoid multiple iterations of permitting and design. Plan for early and ongoing coordination with regulators (pre-application meeting).
Delineation	Adequately delineate stream and wetland boundaries using required methods, preferably with an airport-wide delineation, to reduce time commitments on individual projects.
Documentation	Submit complete notifications and applications.
Mitigation	Consider enhancements to existing surface waters to get mitigation credit rather than construction of new wetlands or surface water segments. Consider using a single mitigation site for multiple projects to reduce coordination and costs. Verify that the location of mitigation areas is compatible with wildlife hazard management requirements.
Start of Work	Verify that federal agencies have fully completed activities and issued permits and approval before construction.

Summary of Fact Sheet 2: Surface Water and Groundwater Quality

The term "surface water," from a water resource perspective, can include streams, rivers, lakes, wetlands, harbors, territorial seas, waters of the contiguous zone, and oceans. Groundwater is a natural resource that is relied upon as a source of drinking water for much of the United States (*2*). Because surface water and groundwater have a clear relationship and are primarily distinguished by their location, they are jointly discussed in a single fact sheet.

Airport development projects can affect surface water and groundwater quality as a result of changes in the site characteristics affecting storm water discharges from the development site, changes in pollutants associated with construction, changes in pollutants associated with subsequent operations, and controls required to mitigate for those changes. Often the impacts to surface water quality at airports are related to changes in the quality, quantity, and discharge location of storm water runoff. Above ground and underground contamination sources can also impact groundwater quality.

Activities that may affect surface water and groundwater quality are regulated primarily through the CWA and the Safe Drinking Water Act (SDWA). When assessing the applicability and impacts of these regulations on development projects, it is important to understand that the terms "surface water" and "groundwater" can have very specific regulatory meanings that may not always correspond to the general understanding of the terms. Changes to the characteristics of discharges to surface waters and groundwater associated with a development project may be subject to existing airport-specific permit conditions associated with those regulations. New or amended permits allowing the discharges under specified conditions may also be required for the execution of the project.

Project planning and design considerations typically associated with surface water and groundwater quality include the following:

- Will the location(s) for discharge of surface waters be changed?
- Will new or additional pollutants be exposed to storm water runoff as a result of the project?
- Will the locations where pollutants are exposed to storm water change?
- Will changes in storm water runoff quantities or flow routing affect pollutant concentrations?
- What is the timeframe for assessing water quality issues, preparing permit applications, and receiving permit conditions from regulators?
- Will storage and treatment be necessary to meet regulatory criteria, where will it be located, and how much space will be required?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing surface water and groundwater quality issues on the development project are presented in Fact Sheet 2 in Appendix B. A summary of the guidance for reducing those project impacts follows.

Guidance for Reducing Project Impacts from Managing Issues Associated with Surface Water and Groundwater Quality

Characterization of Discharges	Obtain buy-in from all stakeholders on the baseline data for future pollutant discharges.
Modeling, Calculations, and Analyses	Submit modeling plans to regulators for approval prior to executing work.

Wasteload Allocation Analysis for Assessing Water Quality-Based Effluent Limits	Perform calculations for assessing receiving stream assimilation capacities and allowable effluent limits and submit to regulator for review.
Siting for Controls	Consider potential land areas needed for storm water storage and treatment in the earliest planning stages. Seek to locate the development project in areas that will not impact surface or groundwater resources and not attract wildlife hazardous to aviation.
Unintended Impacts	Verify that meeting compliance requirements associated with surface water quality for one development project do not inadvertently trigger additional compliance requirements for others.
Design Implementation	Provide alternatives that avoid or minimize impacts to surface water or groundwater and design projects that do not require unique engineering, construction, or monitoring needs. Perform detailed cost analyses that consider both capital and operating costs when considering treatment alternatives for storm water containing pollutants.
Permit Acquisition	Notify regulatory agencies early in the process and discuss key issues and permit requirements. Define National Pollutant Discharge Elimination System (NPDES) permit limits and conditions prior to design to avoid changes during design. Understand that controls and mitigation measures may not be able to be assessed until regulatory conditions are defined. Determine times to prepare permit applications, statutory schedule and review requirements, and expected review time by regulatory agencies. Submit permit to install applications as far in advance of construction as possible once design documentation is available.
Storm Water Management	Seek to minimize the volume of storm water that must be managed to achieve compliance.
Stakeholder Coordination	Coordinate with stakeholders such as airlines, various airport departments, and nearby communities to avoid multiple iterations of permitting and design.

Summary of Fact Sheet 3: Storm Water Quantity and Floodplains

Many of the most common airport development projects can affect the quantities of storm water discharged from the airport site. Those storm water discharges can in turn affect the propensity for regional flooding and runoff-related impacts. Airports are frequently located near water bodies and as such, airport projects can affect, and be affected, by floodplains.

Regulation of storm water quantities associated with development projects has occurred primarily at municipal, regional, and state levels to date. Storm water quantity regulations are typically designed to protect downstream infrastructure and minimize flooding during large, infrequent storm events. The regulations often include requirements allowing little, if any, change in the runoff quantities before and after development projects. A series of federal orders and guidelines, plus some state regional requirements have been enacted and developed to protect floodplains. The key elements of the regulatory framework include developments within a floodplain, increases to flood elevations, and changes to runoff inside the floodplain.

Airport development projects that involve construction of new impervious surfaces (e.g., pavement, buildings) in previously undeveloped areas are typically the types of projects most affected by storm water quantity and floodplain regulations. Projects where one type of impervious surface is replaced by another typically are not affected significantly.

Project planning and design considerations typically associated with storm water quantity and floodplain regulation compliance include the following:

- Does the project extend into the 100-year floodplain?
- Will the project's unavoidable location result in additional flooding or endanger human life?
- What are regulatory requirements governing flow rates and volumes from new developments?
- Is there an existing storm water runoff and transport model to characterize discharges?
- Will any storm water be diverted to a new discharge location and new watershed?
- Will storm water detention be required to meet regulatory requirements, how much space will it require, and where will it be located?
- Will storm water detention cause issues with wildlife attractants?
- Will storm water piping and pumping be required to convey storm water to detention structures, treatment facilities, or new discharge locations?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing storm water quantity and floodplain issues on the development project are presented in Fact Sheet 3 in Appendix B. A summary of the guidance for reducing those project impacts follows.

Guidance for Reducing Project Impacts from Managing Issues Associated with Storm Water Quantity and Floodplains

Water Resource Inventory	Create an inventory for storm water data that includes maps of airport areas with flooding issues and capacity limitations. Understand the source of the floodplain boundaries obtained from federal agencies and include mapping of floodplain boundaries in the inventory. The boundaries in Flood Insurance Rate Map (FIRM) documents may not be accurate on smaller project scales.

Modeling, Calculations, and Analyses	Coordinate with regulators to determine approved modeling programs, calculation protocols, and level of detail that may be acceptable. Identify the appropriate level of detail to collect in support of modeling and analyses and provide a reasonable estimate of storm water discharges (e.g., select a minimum pipe size or drainage basin size to be modeled).
Conceptual Planning	Consider development of a storm water master plan or integrating storm water master planning into airport master planning. Master plans may be useful for considering the storm water needs for long-term or phased development, in addition to widespread development.
Control Siting	Consider potential floodplain impacts associated with long-term development as part of storm water master planning process. Identify and characterize potential sites for controls in the Conceptual Planning Phase. Avoid impacts inside the floodplain, where possible.
Design Implementation	Build infiltration and temporary storage into development project design where possible to reduce extent of necessary end-of-pipe controls. Avoid project-by-project designs of controls that do not consider effects to overall airport storm water drainage. Consider the need for modifications to controls to minimize attraction of hazardous wildlife.
Construction of Controls	Coordinate design and construction of controls with design and construction of the development project to avoid development project delays from unfinished work.
Scheduling and Sequencing	Reduce management and consultant costs with well-planned and coordinated schedules for development project and storm water quantity assessments.
Stakeholder Coordination	Coordinate with local agencies, property owners, and regulators to assist with identifying core regulatory requirements, interests, and data on local flooding issues.

Summary of Fact Sheet 4: Hazardous Wildlife Attractants

The category "hazardous wildlife attractants" encompasses the impacts of airport development projects on wildlife hazards and the associated public safety and aircraft operational issues. The focus of the hazardous wildlife attractants issue is on the potential creation or enhancement of water-based hazardous wildlife attractants associated with new projects or redevelopment at an airport. Although hazardous wildlife attractants are considered a water resource issue in the Handbook, the primary impact associated with these hazards is to airport operations and safety, rather than to the water resources themselves. They are considered a water resource issue because the need to manage wildlife hazards can complicate water resource management associated with new development projects.

Requirements for managing wildlife hazards at airports are aimed at minimizing the attraction of hazardous wildlife to Airport Operations Areas (AOAs), and thus minimizing the risk for collisions between aircraft and wildlife. Federal Aviation Regulation (FAR) 14 Code of Federal Regulations (C.F.R.) Part 139.337 contains specific requirements for performing Wildlife Hazard Assessments (WHAs) as well as developing Wildlife Hazard Management Plans (WHMPs) to investigate and address, respectively, observed wildlife hazards at airports. The FAA's requirements for wildlife hazard management for existing and proposed facilities are largely encompassed in FAA Advisory Circular (AC) 150/5200-33B: *Hazardous Wildlife Attractants on or Near Airports* (*3*). Airport personnel should note that special expertise is needed to conduct much of the analyses described in the fact sheet (e.g., wildlife biologists certified under FAA AC 150/5200-36 or airport wildlife hazard specialists from the U.S. Department of Agriculture's [USDA's] wildlife services).

The FAA's goal for minimizing water-based hazardous wildlife attractants can sometimes conflict with the goals of other regulatory agencies to improve water quality and to provide storm water quantity control through onsite detention and treatment. Coordination among multiple agencies may be required to resolve conflicts to allow the project to move forward.

Project planning and design considerations typically associated with wildlife hazard attractants include the following:

- Will storm water detention be required, will the open basin drain in less than 48 hours, or will the basin need to be covered?
- Does the project have the potential to change infiltration rates, thus creating or reducing the presence of surface waters such as wetlands?
- How long will it take to obtain a resolution among regulatory agencies on conflicting regulations for wildlife hazards, storm water quantity control, surface water quality, and physical impacts to wetlands and other surface waters?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing wildlife hazard attractants on the development project are presented in Fact Sheet 4 in Appendix B. A summary of the guidance for reducing those project impacts follows.

Guidance for Reducing Project Impacts from Managing Issues Associated with Wildlife Hazard Attractants

Identification of Hazardous Wildlife Attractants	Determine the potential for hazardous wildlife attractants associated with the project and surrounding areas early in the Detailed Planning Phase.

Data Collection	Perform a WHA and develop a WHMP early in the Detailed Planning Phase and submit to the FAA and USDA for review.
Design Development	Consider combinations of project modifications, operational techniques, deterrents, or controls that are the most cost effective. Carefully consider the documented effectiveness of wildlife hazard attractant control methods.
Control Siting	Locate projects in areas where there are no issues associated with hazardous wildlife attractants.
Mitigation	Identify potential hazards and mitigation approaches in the Conceptual Planning Phase, and incorporate management techniques and wildlife hazard deterrents into design features to the extent possible.
Staffing	Involve airport and airline experts in wildlife hazard management and aircraft safety and local Wildlife Service representatives in Conceptual Planning and Detailed Planning Phase discussions.
Stakeholder Coordination	Communicate wildlife hazard attractant concerns to other entities that may be considering storm water or flooding controls in vicinity of airport. To the extent possible, facilitate coordination between agencies regulating storm water quantity and agencies regulating wildlife hazard attractants in the Conceptual Planning and Detailed Planning Phases.

Summary of Fact Sheet 5: Aquatic Life and Habitat

The category "aquatic life and habitat" encompasses the impacts of airport development projects on the aquatic organisms and their habitats. This includes plants, animals, fish, microorganisms, and so forth associated with or dependent upon water resources or the immediate surrounding area; federally threatened and endangered species; and state-protected species and habitat.

While most of the regulations associated with aquatic life and habitat are federal, protected species are listed under both federal and individual state regulatory requirements. The principal federal regulations governing aquatic species and their habitats are associated with the Endangered Species Act of 1973 (ESA). Section 7 of the ESA requires federal agencies to conduct consultations to ensure that federal actions that are authorized, funded, or carried out are not likely to jeopardize listed species or result in destruction or adverse modification of designated critical habitats. Compliance with the ESA is typically administered by the U.S. Fish and Wildlife Service (USFWS). The Magnuson–Stevens Fishery Conservation and Management Act of 1976 (MSFCMA) is the primary law governing marine fisheries management in U.S. federal waters. Compliance with the MSFCMA is administered by the National Marine Fisheries Service (NMFS). NMFS also enforces Section 7 ESA requirements for marine and anadromous fish species, marine animals, and critical habitats for those organisms.

Airport development projects may require the physical removal of aquatic species or habitat. Species and habitats can also be affected through secondary effects associated with ongoing operations such as changes in discharges of storm water or treated wastewater. To satisfy the ESA and MSFCMA, as part of the NEPA process, a review must be conducted to determine whether a proposed action would affect a listed species or crucial habitat. This requires consultation between the lead NEPA agency and the agencies administering compliance.

Project planning and design considerations typically associated with aquatic life and habitat issues include the following:

- Are there designated crucial habitats on the project site?
- Will storm water or other waters discharge from the site into protected habitats or areas potentially containing protected species?
- Which agencies administer compliance with the regulations?
- How will the airport operator coordinate with the NEPA lead agency and the consulting agencies?
- What information is required by the agencies to provide approval for the requested activities?
- How long will it take to acquire the required information and what is the expected timeframe for agency response?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing aquatic life and habitat issues on the development project are presented in Fact Sheet 5 in Appendix B. A summary of the guidance for reducing those project impacts follows.

Guidance for Reducing Project Impacts from Managing Issues Associated with Aquatic Life and Habitat

Data Collection	Perform consultation early in the Detailed Planning Phase to identify potential aquatic life or habitat issues. Adequately delineate protected species habitat, including downstream areas of the project.
Storm Water Management	Consider the need for storm water controls for projects to minimize impacts to downstream aquatic life or habitat.
Design Implementation and Control Siting	Relocate the project to avoid impacts to aquatic life or habitat or provide alternatives that minimize impacts.
Permit Acquisition or Approvals	Obtain information or perform site assessments in association with other permitting or approvals that may be needed.
Construction	Consider the possibility that controls and mitigation for other water resource issues (e.g., detention basins) could lead to impacts to existing species or habitats.
Stakeholder Coordination	Coordinate with regulators early to discuss potential documentation requirements and schedule.
Mitigation	Identify options to mitigate impacts and propose to agency for concurrence.

Summary of Fact Sheet 6: Coastal Zones and Barriers

The category "coastal zones and barriers" encompasses the impacts of airport development projects on coastal resources and the associated effects on water quality, biotic habitat, public safety, and infrastructure.

Regulation of coastal zones and barriers occurs primarily through

- The Coastal Zone Management Act (CZMA) (regulated under 15 C.F.R. 923 and 930) as amended by the Coastal Zone Management Reauthorization Amendments of 1990 (23 C.F.R. 650.211) and the Coastal Zone Protection Act of 1996 and
- The Coastal Barrier Resources Act (CBRA) as amended by the Coastal Barrier Improvement Act of 1990.

The CZMA requires that any development projects with the potential to impact a state's coastal zone comply with requirements of the federally approved state coastal zone management program (if the project is being performed or funded by the federal government). The CZMA is implemented by the states, with federal oversight from the National Oceanic and Atmospheric Administration (NOAA).

Airports performing development along coastal areas need to consider the potential for impacts to coastal zones and barriers. Construction of facilities and infrastructure (e.g., sea walls, jetties, channels, and piers) can have a direct physical impact on coastal resources. Development along the shoreline can also disrupt natural coastline processes (e.g., barrier island migration). Airport projects that change airport features such as land use, vegetation, grading, and increased storm water runoff can result in localized increases in erosion and sedimentation and in the destabilization of the coastline. New development projects also have the potential to alter water quality and quantity. Nonpoint source industrial runoff and point source storm water discharges may contribute to degradation of water quality along the coast.

Project planning and design considerations typically associated with coastal zone and barrier issues include the following:

- Are there designated coastal zones or barriers within the vicinity of the project?
- What local and state agencies manage compliance with coastal zone and barrier regulations and what are the requirements?
- What information is required by the agencies to provide approval for the requested activities?
- How long will it take to acquire the required information and what is the expected timeframe for agency response?
- Can possible mitigation needs and options be assessed in the early planning stages to determine whether they might impact the site, cost, or schedule?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing coastal zone and barrier issues on the development project are presented in Fact Sheet 6 in Appendix B. A summary of the guidance for reducing those project impacts follows.

Guidance for Reducing Project Impacts from Managing Issues Associated with Coastal Zones and Barriers

Data Collection	Consult with state agency to confirm coastal zone boundaries.

Design Development and Control Siting	Consider siting or design alternatives that avoid or minimize impacts to coastal zones or barriers. Coordinate on the siting and design of controls and discharges associated with other water resource issues that are associated with coastal zone impacts.
Stakeholder Coordination	Coordinate with state agency to determine whether there are controls or design modifications that may minimize potential coastal impacts. Consult with state agencies to identify required permits and approvals and potential timeframes to be incorporated into project planning.
Documentation	Submit complete documentation associated with consistency evaluation and in accordance with state-specific requirements.
Construction	Ensure agencies fully complete consultation, coordination, and permitting authorizations before conducting project work.
Mitigation	Coordinate with state agency to determine whether mitigation may be required to address coastal impacts.

Summary of Fact Sheet 7: Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by Congress in 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers or portions of rivers are designated as wild, scenic, or recreational by an act of Congress or by the Secretary of the Interior at the request of a state governor (*4*).

Federal agencies that are responsible for managing a particular stretch of river (including the U.S. Bureau of Land Management [BLM], the U.S. Forest Service [USFS], USFWS, and the National Park Service [NPS]) are required to develop a Comprehensive River Management Plan that provides for the protection of designated river values as well as describes requirements for land development in the vicinity of the river.

Consent for projects affecting wild, scenic, or recreational rivers (also called "Section 7 Consent") must be received before the activity is approved. The federal agency managing compliance may also be invited to be a cooperating agency in the NEPA process. If a designated river is affected, the potential effects of the development project must be characterized with respect to the designated uses and mitigation measures may be necessary to prevent adverse impacts.

Project planning and design considerations typically associated with aquatic life and habitat issues include the following:

- Does the project have the potential to impact areas within the 1/4-mile corridor protection zone or change the designated values (i.e., scenery, geology, fish and wildlife, historic resources, or cultural resources) of wild and scenic rivers?
- Does airport property contain use restrictions with respect to wild and scenic river issues?
- What documentation is required by consulting agencies (i.e., USFWS, NPS, BLM, and USFS)?

The process for assessing core regulatory requirements, determining the measures needed for compliance, and reducing the effects of managing wild and scenic river issues on the development project are presented in Fact Sheet 7 in Appendix B. A summary of the guidance for reducing those project impacts follows.

Guidance for Reducing Project Impacts from Managing Issues Associated with Wild and Scenic Rivers

Water Resource Inventory	Understand location of wild and scenic rivers early in the project implementation process.
Modeling, Calculations, and Analyses	Identify the appropriate level of detail and specific methods required by agencies when calculating water quality–related impacts.
Data Collection	Collect additional information beyond the project footprint to ensure downstream impacts are avoided.
Control Siting	Identify potential sites in the Conceptual Planning Phase.
Design Implementation	Design controls that meet the project needs outside of wild and scenic river corridors. Coordinate with development project construction.

Staffing	Identify the expertise needed, select qualified experts, and bring the experts in at the right time.
Stakeholder Coordination	Coordinate with regulators in the Conceptual Planning and Detailed Planning Phases including discussions of funding, authorizing, and NEPA lead agency—especially if impacts necessitate the need to ensure aircraft safety. Coordinate early with stakeholders such as airlines, regulators, various airport departments, and communities to avoid multiple iterations of permitting and design.
Maintenance	Design project so that maintenance needs are minimal.
Permit Acquisition or Approvals	Coordinate permit approval documentation needs with agencies during the planning process.

SECTION 2

Establishing a Water Resource Issue Management Program

2.1 Introduction

Key Notes

The assessment of water resource issues should be an integral part of the project planning process. This may require obtaining a more detailed understanding of these issues earlier in the project implementation process.

Section 2 identifies the elements of a Water Resource Issue Management Program. The purpose of such a program is to establish a framework and baseline information from which water resource issues can be managed within specific development projects. The Water Resource Issue Management Program presented this section serves as an example that an airport operator could follow to facilitate the project planning and execution process. It is expected that airport operators at specific airports would implement the program elements presented here to the degree deemed appropriate to meet their overall management structure, project needs, and available funds. Whatever the structure, a well-planned Water Resource Issue Management Program provides the foundation for improved integration of water resource management into the project implementation process.

While the processes that airport operators use to implement development projects are relatively well established, the processes for managing water resource issues within development projects are not. In part, this is because water resource issue management is frequently not considered to be an integral part of the development project planning process. This results in the tendency to manage water resource issues associated with development projects on an ad hoc basis in which issues are addressed as they arise.

Consequences of Not Utilizing a Clear Structure for Managing Water Resource Issues in Development Projects

1. Project delays due to
   - Late identification of information needs;
   - Insufficient information on existing water resources when decisions are made;
   - Lack of clarity on responsibilities for tasks and decisionmaking;
   - Lack of clarity on how project and water resource issues are coordinated;
   - Lack of definition of the design completion level needed to support NEPA; and
   - Insufficient understanding of regulatory timeframes.
2. Increased costs due to
   - Failure to avoid water resource impacts;
   - Controls/mitigation designed larger than necessary;

- Lack of understanding of mitigation options; and
- Insufficient analysis of the interactions between multiple water resource issues.

3. Changes to project function due to
   - Making project design decisions before water resource issues are assessed;
   - Making decisions based on inadequate information; and
   - Unclear method for factoring in environmental considerations into site selection.

Effective planning for water resource issues—with a goal of reducing effects on development projects—can be facilitated by establishing a Water Resource Issue Management Program. The program recommended herein includes the following elements:

1. Water Resource Issue Information Catalog—
   - Water resource inventory,
   - Project characteristics checklist,
   - Core regulatory requirements, and
   - Mitigation facility inventory.
2. Water Resource Issue Management Plan—
   - Management roles and responsibilities,
   - Protocols for managing the NEPA process, and
   - Protocols for integrating water resource issue management and project implementation process.

The Water Resource Issue Information Catalog provides a common baseline of information from which assessment of water resource issues on all projects can proceed. The catalog should ideally be established outside of the planning process such that the information is accessible at the start of the planning process; this will allow more informed consideration of water resource issues at a point in the planning process where water resource impacts can be most easily avoided.

Key Notes

The first step in efficient planning for water resource issue management is accurately documenting the existing state of water resources at your site.

The Water Resource Issue Management Plan establishes the guiding principles, management structure, methods, and strategies that will be used to execute the management of water resource issues within the context of a development project. Documentation of findings during development of the Water Resource Issue Management Plan development is important. Examples of documentation for key elements of the process are provided in Appendix A and referenced in the subsequent sections.

2.2 Water Resource Issue Information Catalog

2.2.1 Defining Key Terms

One of the challenges of facilitating input among stakeholders with varying experiences and interests is "speaking the same language." In many cases, the same terms will have different meanings to different stakeholders. Some of these terms are crucial to effectively communicating during the development project implementation process.

Key Notes

Defining a common language for discussing water resource issues is an important—but often an overlooked—step.

Terms associated with water resources are particularly important because they may have regulatory implications. Prior to discussing specific techniques for characterizing the water resources, it may be useful for stakeholders to ensure they have a common understanding of the water resource–related terms that will be used in their discussions. The following definitions of key water resource–related terms are used in the Handbook and recommended to stakeholders for consideration:

- **Water resources**—sources of water that may be located on, near, or off airport property, including
  - Waterways (e.g., streams, creeks, rivers, and swales);
  - Water storage and frequent inundation areas (e.g., wetlands, floodplains, ponds, lakes, and detention/retention basins);
  - Subsurface sources (e.g., groundwater); and
  - Coastal and marine resources (e.g., oceans, estuaries, bays, coastal zones, and coastal barriers).

  These resources are valued for their beneficial uses and the life-sustaining qualities they offer to humans and aquatic life. In the context of the Handbook, the definition of water resource also extends to zones, boundaries, reaches, and classifications that have been created by regulations to allow for specific protection of water resources and their uses.
- **Water resource impact**—a negative effect on a water resource based on the regulatory standards for that resource that is caused by the development project. The term includes any effect that a project may have on a water resource and should not be confused with the term "impact," as used by NEPA.
- **Water resource issue**—a potential project effect associated with water resource regulatory requirements that dictates that an airport operator take action. A "water resource issue" moves beyond the direct effect on the water resource as defined by water resource impact and encompasses the full scope of regulatory and project actions needed to manage the impact—including consideration of avoidance.

Water resource issues are associated with particular regulations or groups of regulations. At some point in the development project implementation process, the detailed requirements of those regulations will need to be assessed with respect to the project's water resource impacts. The emphasis on understanding regulation and issue-specific drivers for water resource management is crucial. As such, to support the Handbook and its readers, seven categories for water resource issues have been identified. The categories are distinguished by a combination of the type of physical water resource in the environment and the regulations that are designed to protect those resources for the benefit of human and aquatic life. Each water resource issue category has relatively unique regulatory requirements that must be assessed individually and in different stages of the planning process such that potential significant water resource issues are understood. Because of their distinct regulatory requirements and the fact that there are some unique strategy considerations for the management of each water resource issue, individual fact sheets have been prepared for each category. The fact sheets, listed below, are referenced in the remainder of the Handbook and are found in Appendix B:

1. Physical Impacts to Wetlands and Other Surface Waters,
2. Surface Water and Groundwater Quality,
3. Storm Water Quantity and Floodplains,
4. Hazardous Wildlife Attractants,
5. Aquatic Life and Habitat,
6. Coastal Zones and Barriers, and
7. Wild and Scenic Rivers.

2.2.2 Creating a Water Resource Inventory

An important Handbook principle is that airport staff know its water resources. Knowing water resources involves understanding the types of resources as well as their location(s), extent, quality, regional functions, and regulatory designation or status.

Key Notes

It is difficult to make good planning decisions on water resource issues if the characteristics of the water resources at the site are not sufficiently understood.

Typically, the depth of knowledge of water resource increases as the project proceeds through the project implementation phase. Having comprehensive and credible information on water resources available prior to project conception or during early project implementation phases is a crucial aspect of making good decisions and minimizing the effects of water resource issue management on the development project.

Key Notes

Deciding to fund early assessment of water resource issues is a cost- and risk-based decision that may vary from project to project.

One means of having water resource information available early in the project implementation process is through the development of a Water Resource Inventory. This can be done independent of project planning or as part of the planning process itself. A Water Resource Inventory should provide a baseline characterization of existing water resources on the airport site, as well as water resources on surrounding areas that may be affected by or affect airport development projects. A well-conceived inventory provides the following benefits:

- Data for better informed initial siting and layout decisionmaking during the Conceptual Planning Phase;
- Information for initial discussions with regulators;
- Information to support the NEPA process;
- A common reference point for assessing water resources on multiple projects;
- Information with documented sources and levels of accuracy to provide more representative comparisons of potential impacts for multiple projects;
- Cost savings by avoiding the need to reassess water resources on a project-by-project basis;
- Reductions in schedule impacts during early planning by potentially avoiding a data consolidation and collection step; and
- Reductions in negative impacts to the development project function, airport operations associated with the development project, project schedule, and project costs resulting from decisions made using insufficient water resource data.

The information contained in an inventory may vary depending on the water resources and local regulatory conditions, but generally should include the following, as available:

- Maps showing general locations of the various resources, including
  - Wetland inventory maps (jurisdictional and non-jurisdictional);
  - Surface water maps for the local watersheds;
  - Onsite detention, retention basins, ponds, lakes, swales, ditches, creeks, streams, and regulated outfall locations;
  - Off-site features including basins, ponds, lakes, bays, oceans, ditches, creeks, streams, and rivers;
  - 100-year floodplain boundaries and floodway boundaries;
  - Coastal zone boundaries;
  - Hydrogeological maps;
  - Drainage or flood management district boundaries; and
  - Environmental or ecological zones.

- Narrative descriptions of the resources
  - Known past issues or regulatory actions, and
  - Comments on public interest.
- Regulatory designations, including designated uses and quality ratings.
- Other existing documentation, including
  - Storm Water Pollution Prevention Plans (SWPPPs);
  - Spill Prevention, Control, and Countermeasure (SPCC) plans,
  - Best Management Practice (BMP) manuals,
  - NPDES permits, and
  - Existing or historical permits for the facility.
- Adjoining community or other land use plans.
- Supporting information that may not specifically be a water resource, but supports assessment of water resources
  - Topographical maps,
  - Land use maps for the airport and adjoining communities,
  - Storm water infrastructure drawings,
  - Deicer use records and deicer application locations,
  - Water quality data, and
  - Water quantity data.

Information for completing a Water Resource Inventory can come from a variety of sources. Typically, inventory information for identifiable water resources can be obtained from several sources, including

- Publicly available information from historical characterization that an airport operator can obtain directly (e.g., National Wetlands Inventory [NWI] maps or watershed maps);
- Publicly available information that can be obtained upon request from regulatory agencies (e.g., presence of endangered species and their habitats or floodplain boundaries); and
- Regulatory documents.

Information from these sources is typically easy and economical to obtain. The quality of the information, however, needs to be carefully considered in relation to its effect on project decision-making. The information in publicly available documents is frequently acquired from higher-level assessments that do not always capture important site details. The data also may not represent current conditions. Over reliance on data from these sources to characterize site-specific issues can increase the risk to project function, costs, and schedule from misinformed decisions.

If it is determined that significant risks exist, the Water Resource Inventory can be supplemented by information from the following sources that may provide more detailed, site-specific data:

- Information held by entities owning land surrounding the airport that may have been obtained from site-specific characterization. This should be limited to areas that can potentially impact or be impacted by the development project.
- Existing site-specific characterization data at the airport from previous environmental inventories, previous project investigations, and past permit applications.

If integration of this existing information proves insufficient to reduce risk to the desired degree, it may be necessary to acquire detailed data from new field surveys. Obtaining site-specific information can be costly, and it may be difficult to justify the expense early in the planning process, espe-

Key Notes

It is crucial that the project team ask environmental compliance specialists to define the degree of accuracy required in characterizing water resources for the purpose of assessing compliance.

A lack of sufficient accuracy may trigger the need to collect additional field data on water resources late in the project.

cially if multiple project sites are under consideration and the development area is large. As a result, it is important to seek consultation on defining how the risk of not collecting sufficient water resource data will be assessed. Such an analysis is challenging because it involves a comparison of real, verifiable, and short-term costs (the cost to complete the field assessments and establish the inventory) to potential costs that may be incurred should unanticipated water resource issues become problematic on a project. Allocating resources for early planning does run the risk of spending valuable budget on items that may have no clearly defined payback; however, it is entirely possible that paybacks greater than an order of magnitude can be achieved through costs saved by not having to manage issues that develop later in the project.

One means of balancing cost and risk for a Water Resource Inventory is to identify the water resource locations that are most crucial to the development project moving forward and then perform a gap analysis comparing the quality of the existing information with the quality of data ultimately needed for permitting and design. Crucial water resource locations could be defined as

- Sites where there is a high likelihood that the project will be constructed and
- Sites where water resource issue management may be especially challenging.

Focusing on crucial water resource locations for data collection can reduce the outlay of costs. Assessment of the most crucial areas may require input from experts of water resource and experts in associated regulations. The experts should identify the extent and characteristics of data that are acceptable to regulators during the permitting process.

An airport may find that establishing methods for tracking development project life-cycle costs on projects, specific to cost impacts from water resource issue management, strengthens the ability to demonstrate the benefit of early planning for water resource issues on future projects. Such a tracking system can certainly be a challenge to implement, but may be beneficial for airports with many planned development projects.

It is important that the Water Resource Inventory be updated whenever additional site-specific information has been obtained on projects. Over time, this will build the extent and quality of the inventory to the benefit of future projects.

Key Notes

The risk to project function, cost, and schedule incurred late in projects by inadequately funding early assessment of water resource issues should be a consideration in budgetary planning.

Evaluation of risk-based costs is a project-by-project consideration.

It is recommended that water resource inventories be developed prior to the Conceptual Planning and Detailed Planning Phases. Most often, this data is not collected until the NEPA process is initiated. The Handbook recommends that an inventory be established before project planning and, thus, before the NEPA process. Creation of the inventory in this fashion will result in cost savings as the NEPA process is initiated because that process can rely on the same data, with little updating.

2.2.3 Water Resource Impact and Issue Checklist

An additional step in improving the effectiveness of the process is achieving an increased awareness of the linkages between development projects and water resource impacts. Greater awareness of these linkages by those responsible for planning should facilitate improved decision making when initiating the project planning process. Creating a checklist

Key Notes

Water resources are not typically a problem until they are potentially impacted by a project.

Early understanding of the possible impacts of project alternatives on water resources should be sought and documented.

of possible water resource impacts and issues associated with potential projects can provide good baseline information for initial planning efforts.

Despite seemingly significant differences in scope, many development projects can have similar effects on water resources. This is because when managing water resource issues, the features and characteristics of a development project and its post-construction operations are typically more important than the type of project. For example, a new runway development project may have vastly different operational objectives, extent, cost, and regulatory burden than a parking lot development project. From a water resource issue perspective, however, both projects may require a large amount of new impervious surface to be constructed on previously undeveloped land. Thus, both projects may have similar water resource impacts and water resource issues to manage, such as filling of wetlands, increases in storm water quantities, and impacts to water quality. Understanding the critical features of a project and its associated post-construction operations are therefore important steps in managing the water resource issues.

The project characteristics affecting water resources can be considered from two perspectives:

1. Issues associated with **siting and construction,** which are short-term or one-time water resource issues, and
2. Issues associated with **ongoing activities,** which are continuous or repeated long-term water resource issues from operations after construction.

An example of water resource issues related to siting and construction is the clearing of natural vegetation and excavation of natural soils, replacement of them with engineered fill and subgrades, paved surfaces, and structures. These actions can physically impact water resources not only by reducing the extent of the water resource, but also through disruption of natural processes, reduction in function or quality of the water resource, and destruction of habitat for aquatic and terrestrial species. Siting and construction issues can be minimized by thoroughly evaluating project alternatives including relocating the project to an area where no water resources will be impacted. Depending on the project type, the range of alternatives will vary. For example, alternatives for new or relocated runways would be more limited compared with a parking lot because of aeronautical design standards (i.e., orientation to the wind) that often limit the location of aeronautical facilities.

An example of a water resource issue related to ongoing activities after construction is the alteration of natural storm water runoff drainage patterns and characteristics caused by changes to the surface features. Increased impervious area, vegetation removal, steeper slopes or regrading, and flow diversion have the potential to increase runoff flows, decrease infiltration, increase erosion and sedimentation, increase flooding, and degrade water quality. Water quality may also be impacted from runoff associated with construction activities and long-term airport operations. The disruption of natural drainage patterns through land use and drainage system design can introduce avenues for water resource contamination and other impacts that did not previously exist under pre-development conditions, as well as destabilize soils and fragile land features that may have previously been at equilibrium with natural processes.

It is recommended that prior to the initiation of planning activities, airport operators create a checklist that links projects to project characteristics, to effects on water resources, and, finally, to water resource issues that need to be managed. Worksheet 2 in Appendix A provides an example of a checklist to identify potential impacts on the basis of project siting and construction impacts and ongoing operations impacts. Tables 2 and 3 can be used for guidance in completing the checklist. The checklist results can be used to help assess the water resource issues for which core regulatory requirements should be derived and to provide an initial assessment of the water resource issues that may be problematic.

Table 2. Water resource issues potentially associated with project siting and construction characteristics.

Characteristic	Defining Features	Potential Water Resource Issue
Project Dimensions	• Total project footprint • Length/width/shape • Depth	• Surface water quality • Physical impacts to wetlands and other surface waters • Groundwater quality • Floodplains • Aquatic life and habitat
Project Location	• Proximity to coast • Demolition requirements • Proximity to existing wetlands • Proximity to existing streams • Topography • Proximity to existing endangered species habitat • Groundwater characteristics • Surface water characteristics	• Coastal zones and barriers • Aquatic life and habitat • Floodplains • Physical impacts to wetlands and other surface waters • Groundwater quality • Surface water quality • Hazardous wildlife attractants
Surface Characteristics	• Final open water features • Final groundcover/pavement/land use • Area of earthwork during construction	• Surface water quality • Hazardous wildlife attractants
Subsurface Characteristics	• Utility connections required • Subsurface piping • Depth/excavation requirements	• Physical impacts to wetlands and other surface waters • Surface water quality • Groundwater quality

2.2.4 Defining Core Regulatory Requirements

An additional component of the Water Resource Issue Information Catalog is a summary of the core regulatory requirements associated with water resource issues that might be relevant to the airport. Airport operators should use the information from the Water Resource Inventory and Project Characteristics Checklist as the means to identify which Water Resource Issue Categories should have core regulatory requirements summarized.

Key Notes

The core regulatory requirements associated with each water resource issue category should be relatively similar from project to project. Documenting the core regulatory requirements for each category will add consistency to the approach and develop a greater depth of knowledge for the staff.

To summarize the core regulatory requirements for water resource issues at an airport, operators should be familiar with individual water resource–related regulations. Water resource regulations exist at federal, state, regional, and local levels to protect water resources and the many beneficial uses they provide. The regulatory protections address a variety of impacts to water resources, including the following:

- Water resources such as lakes, streams, reservoirs, and groundwater aquifers are frequent sources of drinking water for humans and animal populations, as well as habitats for aquatic

Table 3. Water resource issues potentially associated with project ongoing activities.

Characteristic	Defining Features	Potential Water Resource Issue
Project Dimensions	• Total project footprint • Length/width/shape • Depth	• Groundwater quality • Storm water quantity • Surface water quality • Hazardous wildlife attractants • Aquatic life and habitat
Surface Characteristics	• Surface type – Water – Land • Perviousness • Topography • Activities on surface when operational – Exposure to precipitation – Storm water storage – Fueling – Deicing – Cleaning/washing – Pesticide/herbicide application – Material storage – Maintenance – Parking – Treatment processes	• Hazardous wildlife attractants • Aquatic life and habitat • Storm water quantity • Surface water quality • Groundwater quality
Subsurface Characteristics	• Activities below surface – Storm water conveyance onto project site – Underdrains – Fuel transmission – Material storage – Areas of contamination/ hazardous materials	• Groundwater quality • Surface water quality

and terrestrial species. Degradation in water quality can endanger human health as well as negatively impact the health, population, and biodiversity of terrestrial and aquatic species.

- Water resource impacts have the potential to decrease the scenic and recreational values of certain water resources, including rivers and coastal zones, with a potential for impacts to tourism industries and local economies.
- Economic impacts can result when water resource degradation impacts fishing, agriculture, and other industries that depend on the water resource.
- Property damage and loss of human life can result from flooding caused by impacts to storm water quantity, floodplains, and wetlands, as well as from increased storm damage caused by impacts to wetlands, coastal zones, and barriers.

Regulations in the United States provide a variety of means to protect the beneficial uses of water resources, including numeric criteria defining the uses, narrative restrictions, prohibitions on activities and construction locations, and specific conditions limiting degradation of the resource. The regulations define the processes used by airports and regulations to assess water resource impacts and how mitigation for impacts must be addressed.

Managing the regulatory environment for airports can be complex because regulations can exist at multiple governmental levels and contain ambiguities and conflicts that can have various

interpretations by various stakeholders. In the end, there is no substitute for careful review of the applicable regulations and interpretation of their meaning by qualified environmental professionals, legal counsel, and regulators for the specific potential impacts to water resources on a project.

Prior to the detailed, project-specific analysis of regulatory requirements that must occur, however, it can be valuable to airports to identify the core regulatory requirements for guidance in the early planning processes. Greater awareness of the core regulatory requirements prior to planning can reduce the risk of impacts to project function, airport operations, schedule, and cost.

The core regulatory requirements for individual water resource issue categories should be relatively consistent from project to project at a given airport. Understanding those requirements can provide airports with greater facility in assessing issues that may arise and their effects on the development project planning process. Having a common understanding of the core regulatory requirements can save time and money at the start of project planning and can provide a more-informed means of screening initial project alternatives.

The core regulatory requirements should include documentation of the following:

- Potentially applicable regulations (federal, state, regional, and local);
- Regulatory documents to reference;
- Agencies with jurisdiction and regulator points of contact;
- Regulated parameters;
- Compliance requirements;
- Submittal requirements for the regulatory approval process;
- Mitigation criteria; and
- Statutory timeframes.

To assist in developing this understanding, flow charts illustrating the recommended steps for defining the core regulatory requirements are provided in each individual fact sheet in Appendix B. The flow charts are specific to the water resource issue. An example of one of the flow charts is provided in Figure 3.

Documenting a summary of the core regulatory requirements for each water resource issue at an airport for a project can be a useful communication tool. An example of a summary sheet for core regulatory requirements is given in Worksheet 3 in Appendix B.

2.2.5 Creating a Mitigation Facility Inventory

It is the goal of most stakeholders to avoid impacts to water resources if possible. It is hoped that implementation of the methods in the Handbook will facilitate a greater degree of avoidance. In cases where water resource impact avoidance and meeting project objectives are incompatible, impacts can be allowed if authorized by regulatory agencies with appropriate jurisdiction. Approval of impacts will typically require some form of mitigation to offset the loss of the water resource or reductions in its value. Mitigation can take many forms: there are typically hierarchies of preferred mitigation measures associated with individual regulations and regulatory agencies. The hierarchies include use of existing facilities specifically designed to support mitigation from multiple projects. At the earliest stages of planning, it is useful to have an understanding not only of the general mitigation requirements (obtained from documentation of the core regulatory requirements), but also of the mitigation facilities that might be available in the airport's locale. It is recommended that operators identify these mitigation facilities for inclusion in the Water Resource Issue Information Catalog. Potential mitigation facilities to seek out include

- Wetland mitigation areas specifically developed by airport operators to support multiple airport projects;

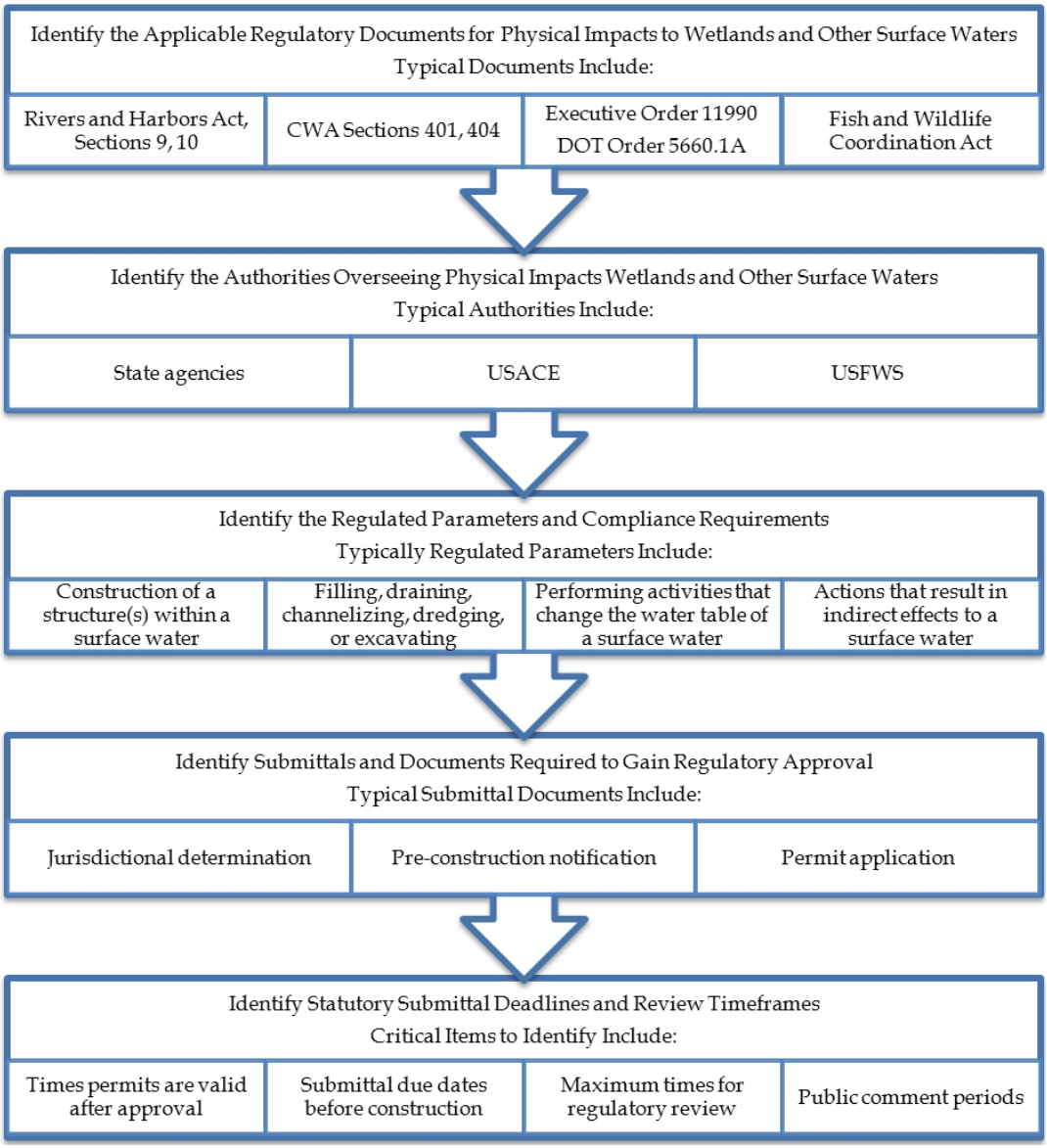

Figure 3. Example process for defining the core regulatory requirements for physical impacts to wetlands and other surface waters.

- Wetland mitigation banks approved by the USACE;
- Stream mitigation areas approved by the USACE (these may be available within some wetland mitigation banks);
- Regional storm water management facilities that can be used to manage storm water quantity compliance requirements from development projects; and
- Publicly owned treatment works (POTWs) that can accept discharges of storm water or process wastewater.

In addition to these facilities, airport operators may want to consider local waterways that might be suitable for stream restoration actions or for creation of conservation easements that would protect the streams from development in perpetuity (provided they do not create or enhance habitats attractive to wildlife hazardous to aviation).

In the Mitigation Facility Inventory, the airport operators should document the following for each mitigation category:

- Currently available capacity within the facility;
- Permit requirements for use of the facility, including submittal requirements for permit applications;
- Costs for use of the facility;
- Copies of standard permit conditions and agreement terms;
- Verification that facility is approved for mitigation of the affected water resource issue by the regulating agency; and
- Timeframes associated with use of the facilities.

2.3 Water Resource Issue Management Plan

A Water Resource Issue Management Plan is a document used to guide the process of managing water resource issues within the development project implementation process. The plan identifies the stakeholders who will be involved and the protocols, methods, and strategies that will be used. Some airports may want to include airport policies related to the subject matter in the plan.

Key Notes

A well-thought-out and documented plan for how to coordinate between water resource issue management and development project implementation will have a significant effect on reducing impacts to the project.

It is recommended that the general elements of the Water Resource Issue Management Plan be developed as part of the Water Resource Issue Management Program outside of the planning process. When planning processes are initiated, the plan should be modified to adapt to project-specific needs. Utilization of this strategy should provide an important level of consistency to the approach to water resource issue management through the ongoing implementation of multiple development projects. Individual elements of the plan are described below.

2.3.1 Project Management Roles and Responsibilities

A well-defined and communicated program structure for managing water resource issues will reduce the potential for unnecessary project delays and costs. All airports have their own unique organizational, management, and personnel structures for development project implementation and water resource issue management. The uniqueness in management structures can be traced to a variety of factors, including the following:

- Number and types of operations (e.g., hub, non-hub, cargo, general aviation, or military);
- Staff resources and time commitments;
- Organizational mission, policies, philosophies, and protocols;
- Funding availability;
- Number, distribution, and level of involvement of airlines;
- Roles and relationships with tenants;
- Use of airport staff or consultants;
- Local regulatory structure, regulations, and involvement;
- Regional and local attitudes and approaches toward environmental compliance, stewardship, and sustainability; and
- Involvement of interest groups.

The organizational structure for development projects can encompass a variety of stakeholders. Frequently involved stakeholders, their typical roles, and descriptions of their responsibilities are provided as follows.

1. **Airports** (*5*):
   - **Airport Authority, Board, or Government Commissioners**—responsible for administration and development of the airport.
   - **Airport Director**—responsible for day-to-day operation of airport with authority over aircraft operations, personnel, finance, maintenance, construction, and community-relations matters. Involved in the planning process for airport expansion projects and capacity enhancement. Also responsible for compiling the annual airport budget.
   - **Finance and Administration**—responsible for financial matters including purchasing, personnel, facilities, and office management. Participates in fiscal planning and budget administration.
   - **Planning and Engineering**—responsible for supporting airport groups and activities with technical assistance for construction and development projects and industrial safety matters. Also develops standards and performs reviews related to construction documents and contracts and industrial safety.
   - **Environmental**—many airports have a separate environmental department that tracks and manages environmentally related matters, including the acquisition of required permits and approvals; compliance with existing permits and regulatory conditions; response to environmental issues such as spills or contamination; coordination of operations and maintenance (O&M) related to environmental compliance, including compliance monitoring and BMPs; development and maintenance of pollution prevention and spill control plans and programs; and coordination with other departments to review environmental considerations for development projects.
   - **Operations**—responsible for matters involving both airside and landside operations. Airside-related matters include airfield and airline activities, airfield safety, aircraft gate assignments, monitoring of airfield conditions, recommendation of procedures, and compliance with airside regulations, noise, and safety areas. Landside-related matters include security, access, parking, public safety, terminal use, and compliance with operational and security regulations.
   - **Maintenance**—responsible for the maintenance of all airport facilities including buildings, vehicles, and utilities, development of standards and policies for maintenance of these facilities, overseeing maintenance contracts and responsibilities, and coordinating and inspecting maintenance activities.
2. **Airlines:**
   - **Properties/Real Estate Management**—sits on the Airline and Airport Affairs Committee (AAAC) and plays the key role in the approval of airport projects affecting the airline and coordinates the airline's other participants in the project.
   - **Facilities Management**—represents the airline in working with the airport on plans and construction of facilities affecting the airline.
   - **Environmental Management**—works with the airport's environmental staff to address any environmental issues/impacts related to the project from an airline perspective.
   - **Station Management**—the airline's eyes and ears on the day-to-day issues related to the project. Also coordinates cooperative efforts required of airline to accommodate the project such as relocation of activities during construction, and so forth.
   - **Station Plant Maintenance Management**—maintains the airline's station facilities and interfaces with the airport regarding existing station-specific facility information.
   - **Flight Operations**—includes navigation management, flight safety management, runway and taxiway construction group management. There are several functions the flight oper-

ations group performs that deal primarily with accessing the impacts of airport projects on flight safety and changing the information in the pilot manuals regarding airport-specific changes resulting from projects.
- **Station Operational Certification and Compliance Management**—manages the airline's FAA compliance issues at the stations and will assess project impacts on that compliance.

3. **Outside Consultants:**
   - **Development Project Planners**—work with airport operators to assess capacity requirements, lead assessment of development needs and alternatives, and prepare planning documents such as Master Plans.
   - **Development Project Engineers and Architects**—prepare conceptual and detailed design of the development project features. Work with airport on integrating project design with existing airport operations.
   - **Water Resource Issue Engineers and Scientists**—understand details of environmental regulations, provide guidance on coordinating with regulatory agencies on permitting and compliance for individual water resource issues, consider mitigation options, and prepare conceptual and detailed design of controls and mitigation measures.
   - **NEPA Consultants**—assist the FAA and airport planners with project planning and scope; lead the preparation of Environmental Impact Statements (EISs), Environmental Assessments (EAs), or Categorical Exclusions (CatExs); direct data collection efforts; identify project alternatives; and conduct agency and public coordination.

and

4. **Outside Legal Counsel,**
5. **Construction Management Firms,**
6. **Commissioning Agents,**
7. **Contractors, and**
8. **Regulatory Agencies.**

Both development project implementation and water resource issue management have numerous actions that need to be executed. Matching the responsibilities for executing those actions within specific projects to the general project roles and responsibilities of the various stakeholders can be challenging at times. It is not unusual for projects to have gaps, ambiguities, and conflicts in responsibilities and among project roles.

As part of the Water Resource Issue Management Plan, it is recommended that a template for typical roles and responsibilities be created for general use on development projects that include water resource issue management. Once planning is initiated for a particular project, the template can be used as a base from which project-specific roles and responsibilities can be defined.

The definition of roles and responsibilities can be supplemented by protocols describing the interactions among the roles, including identification of points of contact, coordination meetings, protocols for information exchange, and means for addressing conflicts among stakeholders with differing priorities. This process might also benefit by establishing specific environmental and planning goals that are understood by all members of the project team. Worksheet 4 in Appendix A provides an example of how key roles and responsibilities can be documented.

2.3.2 Protocols for Managing the NEPA Process

For all airport projects requiring federal approval, meeting the requirements of NEPA are an essential and overarching aspect of the planning process. An overview of the NEPA process is provided in Appendix C. For the purposes of effectively managing water resource issues associated with development project implementation, it is crucial to define how the NEPA process will be executed as part of the Water Resource Issue Management plan. It is recommended that

Key Notes

The project management team must define—in coordination with regulators—when permitting for individual water resource issues will occur relative to the schedule for the NEPA process.

This will drive the determination of information needs and the schedule for development of design documents.

essential elements of the NEPA process be defined as part of the original Plan development. As individual projects are initiated, the plan for that project can be modeled on those essential elements and modified as needed for the specific project. This may improve the consistency of the NEPA process from project to project.

In the context of water resources, the NEPA process includes an environmental review of a project's (or program's) impacts to water resources and an assessment of water resource mitigation, which may, for example, include storm water detention, wetland mitigation banking, and so forth. NEPA evaluation can be based on a less-detailed definition of a project than is needed in the permitting process. NEPA approval does not guarantee permitting approval.

The NEPA process requires a clear understanding of the elements of a project, the purpose of and need for the project, an assessment of alternatives to the project, and an environmental review of the project's effects on environmental resources—for example, a demonstration that all efforts to avoid and minimize impacts to water resources were considered. In terms of reviewing effects on environmental resources, a demonstration that a project meets all regulatory guidance, standards, and thresholds and the provision of mitigation, if needed, are required under NEPA.

Collection of environmental baseline or inventory data is often delayed until the NEPA process is underway. Virtually all development at an airport cannot occur without one or more federal actions, which triggers compliance with the NEPA. That compliance is demonstrated in the form of a CatEx, an EA, or an EIS. In all cases, the objective of the NEPA documentation is to identify whether the project would exert significant adverse effects on the environment and, where appropriate, identify steps necessary to mitigate adverse effects.

If a Water Resource Inventory is assembled independently prior to the NEPA process, the scope of work necessary under NEPA can be streamlined because the understanding of the probable effect of a project on water resources would be advanced. However, to the degree that FAA participates in the funding of the NEPA process, the early Water Resource Inventory would likely not receive funding unless included in an FAA-funded effort. Refer to Section 2.2.2 for additional information on early planning and Water Resource Inventories.

A key decision in the project timeline is whether to conduct permitting of individual water resource issues as part of the NEPA process. For instance, if a Section 404 permit is required, the USACE must also comply with NEPA before the permit can be issued. Often the FAA NEPA document can be and is used to meet the USACE NEPA needs. A decision by sponsors to include permitting in the NEPA process is usually based on the ability to prepare the permits using the level of project definition/design available at that point. FAA will typically only allow sponsors to prepare up to 25% project design before NEPA is complete, so as not to prejudice the project environmental finding/approval. Depending on the water resource issues and their complexity, undertaking permitting during the NEPA process can slow the NEPA review, but also can shorten the time after NEPA before the permit is issued. Conversely, separating the processes can speed NEPA and, thus, enable the project to move further into design. However, should notable project changes occur during the remaining design (including permitting), the changes could require the NEPA process to be revisited. Therefore, the project team needs to weigh the risks of the two approaches.

In the Water Resource Issue Management Plan, the basic approach to NEPA at the airport should be documented, along with key considerations to decide at the start of the planning process for individual projects.

2.3.3 Protocols for Integrating Water Resource Issue Management and Development Project Implementation

The final aspect of the Water Resource Issue Management Plan is defining the protocols, methods, and strategies for integrating water resource issue management with development project implementation. A recommended approach to this integration is presented in Section 3. The approach is based on the following elements:

- Having sufficiently comprehensive and accurate information on which decisions are based;
- Understanding the continual feeding of information back and forth between the water resource issue assessment and development project implementation;
- Needing to understand compliance concepts independently for individual water resource issues; and
- Grasping the importance of consolidating the effects of complying with multiple water resource issues on development projects.

As part of the Water Resource Issue Management Plan, it is recommended that the guiding principles and execution methods for managing the individual water resource issues be defined.

SECTION 3

Strategies for Integrating Water Resource Issue Management with the Project Implementation Process

3.1 Introduction

The information and overall protocols provided by the Water Resource Issue Information Catalog and Water Resource Issue Management Plan described in Section 2 provide the foundation for initiating the analysis of water resource issues in development projects. The information presented in Section 3 provides strategies and recommendations for the management of water resource issues within the three primary phases of project implementation: Conceptual Planning, Detailed Planning, and Project Execution. In Section 3, the reader will be provided with

- Identification of the four recurring elements that form the basis of an iterative approach to water resource issue management and development project implementation;
- Description of the phases of development project implementations; and
- Strategies and recommendations for actions to consider for each project phase.

The information in Section 3 of the Handbook is complemented by the strategies and recommendations provided in Appendix B fact sheets for specific water resource issues.

3.2 Recurring Elements of Water Resource Issue Management at Each Phase

During each project implementation phase, there are planning actions associated with development project implementation and planning actions associated with water resource issue management. Understanding the relationship between those actions is crucial. In most cases, the relationship between development projects and water resource issues should not be a linear or one-time consideration: it is an iterative, cyclical process (see Figure 4.)

As illustrated in Figure 4, information on the project characteristics informs the assessment of measures needed to achieve compliance with water resource issue regulatory requirements. Likewise, an understanding of the compliance needs feeds back information to the development project, potentially triggering revisions to the project. This process repeats itself in each project implementation phase. This iterative approach facilitates the optimization of the project planning and management process so that decisions can be informed by appropriate experts analyzing appropriate levels of water resource information at appropriate points in the timeline.

Key Notes

Throughout the life-cycle of a project, information must be exchanged regularly between those implementing the development project and those managing water resource issues.

The objective of the methodology presented herein is an iterative, small-scale exchange of information that better manages risk and cost as an alternative to a less frequent, large-scale exchange of information. The proposed iterative,

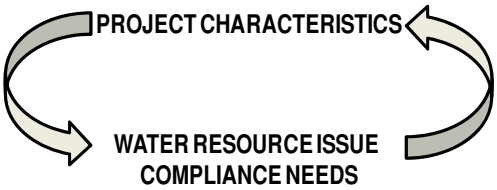

Figure 4. Project and water resource issue relationship.

small-scale approach requires a greater degree of coordination and probably additional financial resources in the early stages of planning. The intent is that this investment of resources would reduce the risks to project function, costs, schedule, and airport operations as a whole.

While each phase of development project implementation has its own unique needs for management of water resource issues, the planning can be reduced to a common set of four steps that recur in each phase. The steps are shown in the corresponding inset as well as in Figure 2 (see Section 1.3.3).

Recurring Steps in the Integration of Development Project Implementation and Water Resource Issue Management

1. Characterize the water resources and potential development project impacts on those resources.
2. Define/reassess the compliance requirements.
3. Assess the effects of complying with regulatory requirements for individual water resource issues on the development project.
4. Consolidate and assess the effects of complying with the full suite of regulatory requirements for all water resource issues on the development project.

Typically, each of these four steps occurs at each project implementation phase. The end result is an adaptive management system in which the implementation of the development project is adapted in response to information obtained from the management of water resource issues and vice versa. The work level and significance of the tasks will vary as the project progresses throughout the project implementation process.

The four recurring steps are discussed in the following subsections. Recommendations for planning considerations and planning actions are provided for each element within the three development project implementation phases. It is not expected that those leading the planning efforts would necessarily perform these activities, but they can facilitate their execution.

3.2.1 Step 1: Characterizing Water Resources and the Water Resource Impacts from Development Projects

The most fundamental aspect of planning for water resource management in development project planning is the characterization of the water resources. The characterization has two individual, but related, elements:

1. Characterizing the water resource as it exists on potential sites and
2. Characterizing how the development project will impact the water resource.

The information acquisition and assessments related to these characterizations may occur in all three project phases. Decisions on the type and level of detail of information that is acquired at each phase in the project are some of the most important decisions in the project implementation process. The characterization of water resources in the initial project implementation stages should build upon the Water Resource Inventory developed for the Water Resource Issue Information Catalog. Once initial information on potential development project characteristics and sites is available, a water resource expert should be consulted to assess the types of data and level of detail for the data that are needed to form a sound basis for decisionmaking. The required data should then be compared with available information (from the Water Resource Inventory, if possible) to assess gaps in the database. From there, cost quotations can be solicited from water resource issue experts for field data acquisition, analysis of the data, and updating of the Water Resource Inventory. To manage costs, airports may want to prioritize the sites that are likely to be used so that data collection efforts can be reduced. Sites with particularly challenging environmental conditions may also receive a higher-priority designation. Once the water resources on the likely sites are documented, the layouts for the development projects can be overlaid on mapping to identify the likely areas of water resources impacts.

Coordination of timing of the project implementation process and acquisition/analysis of water resource data is crucial. Information acquisition for water resource issues to supplement the baseline Water Resource Inventory should begin when initial concepts for site layouts are known. Conversely, final siting of development projects for master plan documents needs to be timed so that plans can be informed by the water resources analysis. To properly time these actions, planners and project managers should solicit feedback from water resource experts on the schedules necessary to complete the various tasks. Crucial needs for information acquisition and exchange that might delay tasks should be identified.

When characterizing water resource impacts, it is important to understand that some water resource issues—especially storm water–related issues—can touch many areas of an airport. Often times, water resource issues are examined within the context of a single development project. Development decisions, and the mitigation measures associated with compliance for those specific projects, can often have unintended consequences on areas of the airport that do not appear to be directly related to the development project. This situation frequently occurs, for example, when the effects of changes in storm water quantities are only addressed within the confines of the project's site or drainage area. Limiting the consideration of storm water effects to the development project areas can potentially create flooding issues in other airport drainage areas and can also handicap storm water management options for other development projects.

3.2.2 Step 2: Defining Compliance Requirements for Individual Issues

It is important that planners and other decisionmakers direct qualified personnel to assess the detailed requirements for demonstrating compliance with water resource regulations. The compliance assessment can build upon the core regulatory requirements documented in the Water Resource Issue Information Catalog. Communication of the key results of the compliance assessment process to the stakeholders is crucial. Qualified experts should perform the review of the compliance requirements based on the potential water resource impacts. In communicating a summary of the compliance requirements with stakeholders, the following should be provided for each of the relevant water resource issue categories discussed in the fact sheets in Appendix B:

- Regulating agency,
- Applicable regulations,
- Regulated parameters,

- Basis of mitigation,
- Required permits and approvals,
- Estimated time to complete permit and approval applications,
- Information needed to complete permit and approval applications,
- Information exchange needed with stakeholders,
- Statutory deadlines for submittal and review,
- Plan for coordination with regulatory agencies,
- Considerations for regulatory review time, and
- Quotations for preparing permit and approval applications.

The detailed analysis of compliance requirements can occur in the Conceptual Planning Phase, but typically occurs during the Detailed Planning Phase. Permit application associated with controls and mitigation measures may occur in the Project Execution Phase as design documents may be needed to support permit applications. As discussed earlier, the timing for the review of compliance requirements and preparation of permit applications must be coordinated with the NEPA process.

Characterizing the compliance requirements associated with water resource issues can be a complex process especially if multiple issues and regulations are involved. In addition to federal regulatory issues, there may be significant variation in state, regional, and local requirements due to unique localized water resource concerns and priorities. Familiarity with existing regulatory conditions and priorities for local issues in advance of development planning can streamline the process for managing water resource issues as well as minimize potential project impacts such as cost and schedule implications. Guidance is provided within the individual fact sheets for the compliance assessment process.

Selecting the time to coordinate with regulators is another important decision. While most regulators emphasize the importance of early communication, it is also true that the airport should have a basic understanding of the issues and compliance requirements prior to any detailed discussions with regulators to make those discussions more fruitful. It may also be beneficial early in the process to identify any pre-existing permits, regulatory agreements with these agencies, and past regulatory issues at the airport. The decision on when to initiate regulatory coordination must be made on a case-by-case basis and may involve an assessment of the significance of potential water resource issues and the complexity of the permitting process. Establishing relationships with particular agency contacts can be extremely helpful when trying to identify regulatory requirements and coordinate reviews. Once communication with regulators has been established, it is crucial to maintain contact at appropriate points in the process and seek to have a mutual understanding of needs regarding information, submittals, and schedule. Because of budgetary challenges in regulatory agencies, it would also be informative to have a common understanding of principle regulatory contacts and their availability to work with the airport in the compliance process. This is crucial—one of the biggest unknowns in the development project implementation process is the time required for regulatory review.

Airport operators may also benefit by consulting with regulators and their resource agencies during the identification and selection of controls. Regulators and their resource agencies often have significant insight and guidance to offer with regard to water resource issue management and may be able to offer creative suggestions for controls or project modifications that will meet project needs. They may also be able to provide feedback on airport-identified conceptual controls and project modifications before significant effort has been invested in design.

Airports should seek consultation from water resource experts on the permits and agencies that are likely to be crucial. Because of the challenges in predicting regulatory review time, entities having experience with crucial agencies on similar projects should be sought. These entities

may also be able to provide guidance on regional or cultural perspectives on water resource impacts. Regions with more restrictive environmental regulations, less historical tolerance for impacts, and particular geographical features (such as coastal areas) may be more reluctant to approve airport projects affecting water resources than regulators in other regions. In these regions, it is especially important to have community involvement and support. It is also important to get input from regulatory officials early on in the process to find out whether preferred alternatives are likely to face extreme permitting challenges.

Representatives from other airports can also be consulted to share experiences on compliance challenges. This could include insight on the timeframe for agency reviews when the airports share a common regulator.

Information gathered at this stage may be able to provide insight as to the submittal requirements for permit applications, including the level of design completion required for different permits. The level of design completion required to support permit submittals can vary widely by water resource issue, by regulatory agency, and by project. Approximate rules of thumb for design documentation required at various planning stages include

- **Initiation of discussions with regulators**—in many cases, it is necessary to have basic conceptual information on a project and potential impacts determined before meaningful discussions can occur with regulatory agencies. This would include conceptual level capacities, footprints, potential controls, and potential capacities of control measures. This information should be available in the Conceptual Design Phase.
- **Submittal of permit applications to individual agencies**—the level of design completion required by agencies with jurisdiction over a particular water resource issue can vary widely. For example, management of storm water quantity issues requires a detailed understanding of the development project surfaces, drainage pathways, and drainage system piping. In that case, an agency may require development project designs that are 75% to 100% complete (expressed as the percent completion of the detailed design) before considering permit applications to be complete. For other water resource issues such as construction in floodplains, only knowledge of the footprint of project impacts relative to the 100-year floodplain boundaries may be needed to describe the impacts.

The level of design completeness that is needed for individual permits and approvals can be an important factor in determining whether permitting occurs concurrently with or subsequent to the NEPA process. Completing the NEPA process is a prerequisite to the federal action (such as the Airport Layout Plan [ALP] approval or federal funding.) A summary of the NEPA process is provided in Appendix C. The following are considerations crucial to an effective NEPA process:

- Maintaining coordination with the lead agency on the NEPA process, which is often the FAA;
- Coordinating with other regulatory agencies with authority to provide specific permits and approvals;
- Using FAA's staff experience on water resource issues and working relationships with the regulatory agencies;
- Coordinating with airport safety personnel to maintain compliance with FAA hazardous wildlife attractant guidelines;
- Developing a clear project definition and project purpose and need on why a water resource must be impacted and how water resource issues and impacts are being addressed;
- Demonstrating that the analysis has been exhaustively evaluated for project alternatives that minimize or avoid impacts to water resources;
- Demonstrating that the project can/will meet all regulatory requirements such as accommodating increased storm water runoff, minimizing onsite storage (e.g., basins must drain within 48 hours per FAA guidance), meeting outfall regulatory standards, and so forth;

- Completing the appropriate level of environmental evaluation and agency and public coordination required depending on the level or type of impact (e.g., impacts to wetlands of 1.5 acres or greater require preparation of an EA);
- Developing appropriate mitigation alternatives and conducting appropriate agency and public coordination;
- Understanding that NEPA approval does not guarantee or provide specific permit approvals;
- Understanding the level of project refinement needed for NEPA approval versus for obtaining permits (e.g., NEPA processing can be based on conceptual plans such as 0%–25% design documents whereas permitting often requires greater detail);
- Implementing changes in the project identified through more detailed design or other considerations determined in support of permitting can require reassessment of the project and consideration of additional alternatives under NEPA;
- Recognizing that schedules looking to begin construction immediately post-NEPA approval must consider conducting concurrent permitting; and
- Minimizing uncertainties in project definition, alternatives considered, and overall impacts requires advancing project design and operational assumptions earlier in the planning process.

3.2.3 Step 3: Assessing Effects of Compliance Requirements on Development Project for Individual Water Resource Issues

The third step in managing water resource issues in development projects is assessing the effects of achieving compliance on the development project for individual water resource issues. As discussed in previous sections, the process of determining the compliance requirements establishes the restrictions and standards that must be met to protect the water resource. In some cases, the restrictions may be complex (e.g., effluent limits for multiple parameters or restrictions on flow rate and total discharge volume), while in others they may be straight forward (e.g., all impacted wetlands must be mitigated for). In any case, if impacts cannot be avoided, measures must be evaluated and approved to meet the restriction and mitigation requirements. The process for assessing the effects of achieving compliance on the development project is one of the more important steps in the entire water resource management process because it often involves the highest cost and has the greatest potential to affect the development project itself.

Every effort should be made to avoid water resource impacts. Avoidance can carry a high project cost or, in some cases, can eliminate the ability of the project to meet its intended purpose. In those cases, controls (e.g., onsite treatment or storm water storage) or offsite mitigation might be necessary for the project to move forward. A well-informed cost analysis is vital in comparing these alternatives. The cost analysis should include not only capital costs, but also post-construction operating and maintenance costs as well as potentially lost revenue.

Even when water resource issues are planned for and regulatory coordination is underway, there may be changes to the project design or regulatory requirements or other unforeseen conditions that arise during the course of project implementation. It can be difficult to know how best to respond to these changing circumstances while still meeting project goals and conditions of compliance. Airports should be advised that changes in project design, project functional plans, or siting may initiate a reassessment of compliance requirements.

At early project implementation phases, it is easy to overlook "secondary" water resource issues that may be created by the mitigation measures needed to achieve compliance with the original development project's water resource issues—for example, storm water controls may be needed to comply with development project impacts to storm water quantities. Implementation of those controls (e.g., a detention basin) might result in impacts to water resources, such as wetlands. Permitting and mitigation for those impacts would be required. If these secondary water

resource issues are not foreseen early in the planning process, they can contribute to difficulties getting timely NEPA approvals, affect the construction schedules for controls, and, in general, increase costs.

3.2.4 Step 4: Consolidating Water Resource Issue Effects and Revision of Project

Effectively managing water resource issues in a planning project requires two important considerations:

1. Understanding and managing the effects of individual resource issues on development project implementation and
2. Integrating effects from multiple water resource issues into a cohesive planning strategy.

As discussed in the previous steps, at each phase of the development project implementation, the individual water resource issue impacts need to be assessed and planned for independently because each issue has unique regulatory requirements and unique mitigations measures. While the concerns and planning items associated with individual water resource issues are a necessary baseline approach, an airport can most effectively improve its development project implementation process by considering the synergistic effects of managing multiple water resource issues.

One of the principal reasons why an integrated consideration of the causes and effects of multiple water resource issues is recommended is because the same development project characteristics tend to cause multiple issues. For example, an increase in impervious area from a new runway can affect both surface water quality and storm water quantity. Even though those water resource issues are governed by different regulations, the controls and measures needed to achieve compliance can sometimes be considered jointly. This process involves first consolidating the various water resource issues and the potential project impacts—consolidating management techniques where possible—and then developing an integrated planning strategy that incorporates these techniques.

As airport operators begin to implement elements of water resource planning, they should begin to consolidate the potential effects on the project from multiple water resource issues. The consolidation will provide the information to assess the following:

- Whether the combined effects from multiple water resource issues provide a more significant driver for avoiding impacts to water resources;
- The options for implementing compromises in the development project functional design that benefit more than one impacted water resource or make compliance less challenging and less costly;
- The need to change nonfunctional elements of the development project design to accommodate controls and mitigation measures (e.g., storm water piping near a runway); and
- The options for integrating controls from multiple issues (e.g., storm water quality and quantity management).

Consolidation of considerations for the various water resource issues should include the following:

1. **Project characteristics or features associated with issues**—a review of project characteristics or features associated with the various issues may allow the identification of a particular project aspect that can be modified to reduce potential impacts.
2. **Detailed steps required for compliance**—a review of compliance requirements, including required permits or approvals, may reveal some synergy for related efforts and the need for coordination on issues that will be regulated by the same authority.

3. **Information acquisition needs**—the review of overall information acquisition needs can facilitate combined efforts for data collection and may provide further justification for funding particular data collection efforts. Information acquisition needs for each step in the compliance process can also be tied to planning activities and estimated timeframes for data availability to facilitate development of a timeline or schedule that integrates development project planning activities and water resource management activities.
4. **Potential need for controls or mitigation measures**—a review of potential control options will provide an opportunity to look for multi-faceted solutions to multiple issues (e.g., a detention basin that meets both storm water quantity and surface water quality needs), as well as the potential for secondary issues associated with controls (e.g., hazardous wildlife concerns associated with detention basins). It will also be beneficial to coordinate land use and utility connections for various required controls.
5. **Timeframes for compliance activities**—the timeframes for various compliance activities, as coordinated with information acquisition needs and availability, will help to build the overall compliance schedule. These timeframes will also help to identify critical path items and prioritize project activities as needed to minimize project impacts.
6. **Potential cost implications to project**—a review of the potential costs for complying with the various issues will illustrate the overall burden of regulatory compliance for the project as it is currently planned. In addition, potentially costly issues may become apparent as those that should be prioritized when it comes to planning efforts and resources.
7. **Potential options for project modifications that may minimize issues**—this step may shed light on any project features that are common to many of the issues, or particularly significant issues, and may warrant reconsideration or modification.

Following the review and consolidation of the items above, airport operators may wish to revisit planned project features and characteristics to determine whether any changes may minimize project impacts. This step would require reevaluation of the effects on individual issues and overall impacts to the project. Once airport operators have determined that further modifications would not be warranted to address the anticipated water resource issues, they may choose to proceed as planned and integrate elements of the items above into the overall project plan. A log of key compliance activities can be developed to allow planners to follow along with activities that will be performed by environmental staff or outside environmental consultants. As the project progresses into later phases, airport operators can track the progress of these activities to keep informed of any obstacles as they arise or any issues that appear to be changing in significance. If and when project design conditions change, the water resource issues should be revisited and the planning strategy updated. If unanticipated impacts arise, any lessons learned should be documented to allow for the further adaptation of airport planning strategies for use on future airport development projects.

3.3 Conceptual Planning Phase Management Strategies

3.3.1 Development Project Management in Conceptual Planning Phase

The Conceptual Planning Phase for airport development projects, as defined herein, is the phase in which development projects are conceived at a conceptual level to meet some need—such as long-term, airport-wide operational needs—based on aviation activity projections.

Development projects considered in the Conceptual Planning Phase may include improvements to landside, airside, and airport support facilities. This phase may include planning efforts for more than one project, and it can include airport master planning, but also includes planning for projects not typically included in a master plan.

Airport master plans and other conceptual plans typically identify high-level airport improvement or expansion projects for a single airport, potentially with information from state or regional airport system plans as a basis. As described in the FAA AC 150/5070-6B, an airport master plan is a "comprehensive study of an airport and usually describes the short, medium, and long-term development plans to meet future aviation demand" (*6*). Airport master plans may vary significantly in scope and level of detail from one airport to the next, depending on the unique challenges and issues faced by individual airports. An airport master plan generally identifies and considers several possible development alternatives to meet improvement or expansion goals, as well as the potential financial, socioeconomic, and environmental impacts associated with each alternative. A variety of other airport planning documents may be developed to describe conceptual planning efforts not associated with a master plan.

Multiple stakeholders contribute to the conceptual planning process: representatives from airports and airport authorities, airlines, tenants, consultants, community entities, regulatory agencies, and other local entities that have an interest in the long-term development at the airport. The outcomes of the Conceptual Planning Phase include

- Identification of capacity needs,
- Concepts for means to achieve capacity needs and other airport development needs,
- Intended project function,
- Identification of potential sites,
- Conceptual sizes and capacities for major project components,
- Conceptual footprints and layouts of the major project components, and
- Conceptual level opinion of probable cost.

3.3.2 Water Resource Issue Management in Conceptual Planning Phase

The Conceptual Planning Phase is an ideal opportunity to identify and begin management of potential water resource issues since it is the time of maximum flexibility in project design and location. It is also the time when steps can best be taken to avoid significant issues later in project implementation. Important planning actions related to water resource issues in this phase include

- Identifying the features for projects documented in conceptual planning efforts that might result in significant water resource impacts,
- Using the Water Resource Inventory as a starting point and soliciting feedback from water resource experts on additional level of detail needed to characterize water resources for crucial development areas,
- Performing, if necessary, risk-based cost analysis to justify additional data collection,
- Revising project concepts and locations to avoid significant water resource impacts,
- Revising project concepts and locations to minimize water resource impacts if they cannot be avoided, and
- Identifying major control and mitigation features that might require significant infrastructure additions and land use such as detention basins or treatment facilities.

The Conceptual Planning Phase is also the time to develop project-specific Water Resource Issue Management Plans based on the plan developed for base Water Resource Issue Management Program. The plan developed at this time can be adapted, expanded, and refined for individual development projects as the implementation proceeds.

A significant question that airports face in this phase is the degree to which water resources and other environmental issues are considered. As discussed above, the upside to a more rigor-

ous assessment of water resource issues at this stage is the opportunity to revise the development project plan during a time of maximum flexibility. Revisions to the development plans at this time can reduce the potentially costly project revisions later in the implementation process. The downside to providing significant consideration to water resource issues at this phase is that the project characteristics may be subject to further change during later project phases and may require that water resource issues be reassessed at a later date—which may entail additional costs and possible schedule delays. Several factors need to be managed to contain costs while still providing useful information:

- Prioritizing the sites and alternatives for which water resource issues will be evaluated (as necessary, beyond the Water Resource Inventory discussed in Section 2);
- Deciding upon the appropriate extent and level of detail for water resource issue assessment to be performed at this phase through use of risk-analysis techniques;
- Understanding the sensitivity of the conclusions on the effects of water resource issue management on development project implementation to the level of detail of water resource information that is acquired; and
- Facilitating coordination between those considering water resource issues and those planning other aspects of the development project implementation.

Another important factor in the Conceptual Planning Phase is establishing the mechanisms of coordination amongst stakeholders, including airport staff, airlines, consultants, regulators, and community entities. These stakeholders can play a large role in facilitating or complicating the management of water resource issues affecting airport development projects. A lack of consistent coordination can result in missed opportunities to combine efforts and can ultimately lead to project impacts if the project design or compliance measures are unacceptable to one or more stakeholders.

The following stakeholder involvement strategies are recommended for consideration in development of overall water resource management strategies:

- **Defining roles and responsibilities.**
- **Coordinating activities among airport staff and their representatives**—a lack of coordination among airport staff or groups, as well as consultants representing them, on simultaneous or consecutive development projects may lead to missed opportunities to share resources and collaborate on comprehensive solutions. Regulators are currently placing a greater emphasis on site-wide, cumulative water resource issues; a lack of consideration for these may complicate regulatory approvals. Inconsistent or uncoordinated regulatory submittals among multiple airport projects can also cause regulatory delays.
- **Coordinating development and mitigation efforts with airlines**—airlines have a vested interested in development projects from both a financial and operations perspective. The level of airline involvement at different airports and airport projects can vary, but developing a means to inform and seek input from airlines early in the project implementation process can reduce impacts to schedules and budgets late in the project.
- **Understanding and addressing public receptiveness**—underestimation of potential public involvement or resistance can lead to unforeseen delays and design rework to obtain regulatory approvals. Airports sometimes present design alternatives that could have been foreseen as potentially infeasible or challenging if public resistance over potential water resource issues had been better understood.

Table 4 summarizes planning items and planning actions for the Conceptual Planning Phase that are frequently associated with each of the four recurring steps in assessing water resource issues in development projects.

54 A Handbook for Addressing Water Resource Issues Affecting Airport Development Planning

Table 4. Planning items and actions for Conceptual Planning Phase.

Step 1: Characterize Water Resource and Water Resource Impact	
Planning Item	**Planning Actions**
Water Resource Data Acquisition	• Obtain recommendations from water resources expert based on sensitivity analysis considerations • Assess cost and risk if sufficient information cannot be obtained from properties not owned by the airport • Update Water Resource Inventory
Development Project Siting	• Create prioritization plan for data acquisition if needed for multiple sites, based on likelihood of use • Develop mapping to superimpose development project layouts on water resources boundaries • Plan for acquiring water resources information on sites not yet owned by airport
Timing for Data Acquisition and Analysis	• Allow at least 6 months prior to the time the information is needed for use in the Conceptual Planning Phase • Coordinate master plan and water resource assessment timing
Costs for Data Acquisition and Analysis	• Consolidate data collection needs from various water resource categories to identify common data • Obtain quotations from qualified entities
Stakeholder Coordination	• Identify stakeholders, their areas of interest, and their desired level of engagement
Step 2: Assess Compliance Requirements	
Planning Item	**Planning Actions**
Applicable Regulations and Regulating Agencies for Identified Issues	• Refer to Core Regulatory Requirements Worksheet
Compliance Requirements Determination	• Solicit key compliance requirements from assessment by water resource experts
Timing for Actions	• Initiate after initial siting of projects and after Water Resource Inventory has been updated • Complete prior to final siting on master plan
Regulatory Coordination	• Coordinate with regulators to clarify interpretations of regulations for permitting • Coordinate with the FAA to develop the NEPA processing strategy
Stakeholder Coordination	• Solicit feedback from stakeholders, including the NEPA team, to identify key water resource issues and potential compliance requirements

Table 4. (Continued).

Step 3: Assess Effects on Development Project from Individual Water Resource Issues	
Planning Item	**Planning Actions**
Issue Avoidance	• Assess whether any water resource issues can be avoided by changes to the project
Potential Controls Outside of Project	• Assess possible types and scope of compliance measures that wouldn't directly affect project • Assess need for additional sites and property acquisition
Potential Modifications to Project	• Assess if project changes may be necessary to achieve compliance or reduce overall costs
Potential Effects on Other Airport Operations	• Qualitatively assess interactions with airport operations and among multiple development projects
Timing of Actions	• Initiate after significant water resource impacts are identified and compliance assessment is completed • Complete prior to finalization of master plan layout
Regulatory Coordination	• Coordinate with regulators for questions on viability of controls/mitigation
Stakeholder Coordination	• Present options for controls/mitigation measures
Step 4: Consolidate Effects of Water Resource Issues on Development Project	
Planning Item	**Planning Actions**
Issue Consolidation	• Consolidate information on avoidance, controls, and modifications to achieve compliance from individual issues
Issue Avoidance	• Assess whether consolidated information presents a greater driver for avoidance than drivers from individual issues
Potential Controls Outside of Project	• Assess whether controls for multiple issues can be integrated
Potential Modifications to Project	• Identify project modifications that would benefit compliance for multiple issues • Compare benefits to reductions in project functionality
Potential Effects on Other Airport Operations	• Identify any combined effects of water resource impacts and mitigation on airport operations
Timing of Actions	• Initiate after compliance options for individual issues have been assessed • Complete before master plan finalization
Regulatory Coordination	• Coordinate with regulators and the FAA as appropriate on viability of mitigation
Stakeholder Coordination	• Present options for controls/mitigation

3.4 Detailed Planning Phase Management Strategies

3.4.1 Development Project Management in Detailed Planning Phase

The Detailed Planning Phase, as defined in this Handbook, includes the activities that are associated with developing plans for implementing the development project concept. At this phase, the project retains a significant degree of flexibility, but the basic components of the project have been established. The outcomes of the Detailed Planning Phase include

- Finalizing project function and capacity objectives,
- Assessing and selecting the project site,
- Developing a basis of design for all project components,
- Developing the approach to project implementation,
- Preparing layouts of project components,
- Developing project schematic diagrams,
- Identifying equipment needs,
- Preparing opinions of cost, and
- Assessing and securing the source of funding.

3.4.2 Water Resource Issue Management in Detailed Planning Phase

The Detailed Planning Phase for development projects also corresponds to the time that management of project-specific water resource issue compliance requirements frequently occurs, although the work can begin earlier during conceptual planning if determined in the Water Resource Issue Management Plan. This phase may include the following water resource management actions:

- Initiating NEPA activities,
- Identifying and quantifying the presence of water resources on potential project sites,
- Performing a detailed review of compliance requirements for individual water resource issues,
- Initiating permitting and approval process for specific water resource issues,
- Assessing the effort required to fully manage water resource issues,
- Holding pre-permitting meetings with water resource regulatory agencies, and
- Determining potential control and mitigation options.

Table 5 summarizes planning items and planning actions for the Detailed Planning Phase that are frequently associated with each of the four recurring steps in assessing water resource issues in development projects.

3.5 Project Execution Phase

3.5.1 Development Project Management in Project Execution Phase

The Project Execution Phase, as defined in the Handbook, includes the activities involved in final implementation of the development project once the site, layout, function, sizes, and capacities have been determined. At this point in the implementation process, the flexibility to change the project is significantly reduced. Effects on the following project aspects from unresolved water resource issues can be significant:

- Detailed design,
- Bidding,
- Construction,
- Commissioning and startup, and
- Initiating operations.

Table 5. Planning items and actions for Detailed Planning Phase.

Step 1: Characterize Water Resource and Water Resource Impact	
Planning Item	**Planning Action**
Water Resource Data Acquisition	• For each water resource issue, perform detailed review of applicable regulations using methodologies in Sections 2 and 3 of the fact sheets to identify data quality needed for regulatory approval • Perform gap analysis comparing data needs with data obtained in Conceptual Planning Phase
Timing for Data Acquisition and Analysis	• Complete 3 months before permit applications are due
Costs for Data Acquisition and Analysis	• Obtain quotations from qualified entities
Stakeholder Coordination	• Meet with stakeholders at start of phase
Step 2: Assess Compliance Requirements	
Planning Item	**Planning Action**
Permitting and Compliance Process	• Initiate the NEPA process • Initiate development of the permit and approval application processes
Identify Key Compliance Parameters	• Solicit summary information from water resources experts on permits, deadlines, compliance parameters, and mitigation requirements
Timing for Actions	• If seeking to begin construction immediately upon receipt of NEPA approval, initiate permitting concurrent with the NEPA process • Understand that NEPA processing timeframes vary significantly based on anticipated project impacts and can range from a couple months to several years • Initiate permit application development process for individual water resource issues 6 to 12 months prior to planned submittal
Regulatory Coordination	• Conduct pre-permitting meetings with regulators for individual water resource issues and the FAA on NEPA processing • Verify required permits and mitigation criteria
Stakeholder Coordination	• Coordinate on permitting approach

(continued on next page)

58 A Handbook for Addressing Water Resource Issues Affecting Airport Development Planning

Table 5. (Continued).

Step 3: Assess Effects on Development Project from Individual Water Resource Issues	
Planning Item	**Planning Action**
Potential Controls Outside of Project	• Select and design controls at the conceptual level
Potential Modifications to Project	• Make decisions on and design project modifications at the conceptual level
Potential Effects on Other Airport Operations	• Conduct detailed modeling and other assessments of effects
Timing for Actions	• Select controls and perform conceptual design in time to support NEPA documents
Regulatory Coordination	• Verify suitability of proposed avoidance and control measures for NEPA approval • Prepare control descriptions for NEPA documents
Stakeholder Coordination	• Coordinate with other development project teams, NEPA team, and airlines on scope and cost of controls and mitigation measures
Step 4: Consolidate Effects of Water Resource Issues on Development Project	
Planning Item	**Planning Action**
Potential Controls Outside of Project	• Identify conceptual options for combining controls and mitigation measures
Potential Modifications to Project	• Coordinate integration of project design with design of controls
Potential Effects on Other Airport Operations	• Identify infrastructure or operational changes needed to manage project impacts
Timing for Actions	• Select controls and perform conceptual designs in time to support NEPA documents
Regulatory Coordination	• Verify suitability of proposed avoidance and control measures for NEPA approval • Prepare control descriptions for NEPA documents
Stakeholder Coordination	• Coordinate with other development project teams, NEPA team, and airlines on scope and cost of controls and mitigation measures

3.5.2 Water Resource Issue Management in Project Execution Phase

The Project Execution Phase for development projects corresponds to the time that the water resource issue management associated with construction is completed and the operational management of water resource issues commences. The following water resource–related activities typically occur during the Project Execution Phase:

- Completing the NEPA process;
- Submitting permit applications and approval documentation for individual water resource issues;
- Coordinating with regulators on status and timing of actions;
- Receiving permits and approvals;
- Modifying development project design to accommodate water resource compliance requirements;
- Evaluating whether project design modification requires NEPA reassessment, consideration of alternatives, or additional mitigation requirements;
- Designing, bidding, permitting, constructing, commissioning and starting up the control and mitigation measures needed to accommodate water resource compliance requirements;
- Initiating monitoring of mitigation measures; and
- Initiating operation of water resource issue control systems.

Table 6 summarizes planning items and planning actions for the Project Execution Phase that are frequently associated with each of the four recurring steps in assessing water resource issues in development projects.

60 A Handbook for Addressing Water Resource Issues Affecting Airport Development Planning

Table 6. Planning items and actions for Project Execution Phase.

Step 1: Characterize Water Resource and Water Resource Impact	
Planning Item	**Planning Action**
Information Types	• Assess new data needs based on regulator review of permit applications
Level of Detail in Data Acquisition	• Plan for detailed collection for missing data to support design
Timing for Data Acquisition and Analysis	• Complete by start of detailed design
Costs for Data Acquisition and Analysis	• Obtain quotations from qualified entities
Stakeholder Coordination	• Meet with stakeholders at start of detailed design and construction
Step 2: Plan Items and Actions for Assessing Compliance Requirements	
Planning Item	**Planning Action**
Permit Conditions	• Review final permit conditions from regulators and mitigation commitments in NEPA approval and assess significance • Submit applications for controls
Timing for Actions	• Coordinate submittal dates permits and design development level • Coordinate permit effective dates with construction schedule
Stakeholder Coordination	• Obtain input and review on proposed permit conditions
Step 3: Plan Items and Actions for Assessing Effects on Development Project from Individual Water Resource Issues	
Planning Item	**Planning Action**
Controls Outside of Project	• Final design and construction • Submit applications for implementation of controls
Timing for Actions	• Coordinate submittal dates for control permits and design development level
Regulatory Coordination	• Meet with agencies to verify controls and permit submittal requirements
Stakeholder Coordination	• Coordinate among design, construction staff, and representatives for other projects
Step 4: Plan Items and Actions for Consolidating Effects of Water Resource Issues on Development Project	
Planning Item	**Planning Action**
Design of Controls and Mitigation Measures	• Ensure coordination among various design entities
Timing for Actions	• Coordinate submittal dates for control permits and design development level
Regulatory Coordination	• Meet with agencies to verify controls and permit submittal requirements
Stakeholder Coordination	• Coordinate among design, construction staff, and representatives for other projects

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Abbreviations and Acronyms Used Throughout This Handbook

AAAC	Airline and Airport Affairs Committee
AC	Advisory Circular
ACM	Airport Certification Manual
AIP	Airport Improvement Program
ALP	Airport Layout Plan
AOA	Airport Operations Area
ARP	FAA Office of Airports
AST	Above-ground Storage Tank
BLM	United States Bureau of Land Management
BMP	Best Management Practice
CAPA	Critical Aquifer Protection Area
CatEx	Categorical Exclusion
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resource System
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CLOMA	Conditional Letter of Map Amendment
CLOMR	Conditional Letter of Map Revision
CLOMR-F	Conditional Letter of Map Revision Based on Fill
CRMP	Comprehensive River Management Plan
CSGWPP	Comprehensive State Ground Water Protection Program
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELG	Effluent Limit Guidelines
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FONSI	Finding of No Significant Impact
FRP	Facility Response Plan

FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information System
GWR	Ground Water Rule
HSWA	Hazardous and Solid Waste Amendments
LOMA	Letter of Map Amendment
LOMC	Conditional Letter of Map Change
LOMR	Letter of Map Revision
LOMR-F	Letter of Map Revision Based on Fill
MCL	Maximum Contaminant Level
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPRSA	Marine Protection, Research, and Sanctuaries Act
MS4	Municipal Separate Storm Sewer System
MSFCMA	Magnuson–Stevenson Fishery Conservation and Management Act
NAVAIDS	Navigational Aid System
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	United States National Park Service
NRI	Nationwide Rivers Inventory
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O&M	Operations and Maintenance
OCRM	Office of Ocean and Coastal Resource Management
OPA	Oil Pollution Act
PCN	Pre-Construction Notification
PFC	Passenger Facility Charges
PL	Public Law
POTW	Publicly Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SIC	Standard Industrial Classification
SPCC	Spill Prevention, Control, and Countermeasure
SSA	Sole Source Aquifer
SWA	Source Water Assessment
SWDA	Solid Waste Disposal Act
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TSCA	Toxic Substances Control Act
UIC	Underground Injection Control
USACE	United States Army Corps of Engineers
USAF	United States Air Force
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USDW	Underground Source of Drinking Water
USEPA	United States Environmental Protection Agency

USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
UST	Underground Storage Tank
WHA	Wildlife Hazard Assessment
WHMP	Wildlife Hazard Management Plan
WHP	Wellhead Protection Program

APPENDIX A

Supplementary Worksheets

Contents

WORKSHEET 1

EXAMPLE **DOCUMENTATION: PROJECT ROLES AND RESPONSIBILITIES**

POTENTIAL ROLES			
Potential Airport Roles		**Potential Roles for Other Stakeholders**	
Airport Management	Procurement/Funding	Airline Environmental Manager	FAA ADO representative
Project Management	Information Technology	Airline Station Managers	NEPA Consultant
Project Planning	Asset Management	FBOs	Regulatory Authority Representatives
Engineering	Wildlife Management	Planning Consultants	Water Resource Permitting Consultants
Construction Management	Contacts for Related Projects	Project Engineering Consultants	Surveying / Field Investigation
NEPA	Facilities	Construction Manager	Water Resource Control and Mitigation Engineering Consultants
Environmental	Public Relations	Construction Contractors	Funding Entities
Safety	Operations	Commissioning Agents	
Legal Counsel	Maintenance	Outside Legal Counsel	

EXAMPLE		
Project Role	**Personnel/Company**	**Key Responsibilities**
Airport Water Resources Coordination	Junie Jones San Bea International Airport	- Contact for environmental consultants - Call coordination meetings with planners on water resource issues - Principal contact with regulators
Development Project Alternatives Report	Ed Dantes Dumas Planning Consultants	- Prepare alternatives report for airport Planning Manager - Coordinate with water resources consultant on control siting needs
Airline Representative	Jed I. Knight OWK Airlines	- Coordinate with Dumas on 2025 aviation forecast - Coordinate with Airport Director on project funding

WORKSHEET 2

EXAMPLE **DOCUMENTATION: PROJECT CHARACTERISTICS AND WATER RESOURCE EFFECTS**

	Feature Present	Water Resource Issue Potentially Affected						
	Y/N	1	2	3	4	5	6	7
Characteristics of Constructed Project								
New Pavement or Structure	Y	✓	✓	✓		✓		
New Outfall	N							
Subsurface Utilities	Y	✓	✓	✓		✓	✓	
Feature Promoting Infiltration or Injection to Groundwater	N							
Water Supply or Monitoring Well	N							
Changes to Vegetation	N							
Waste Disposal Areas	N	✓	✓		✓	✓	✓	✓
Treatment Facility	Y	✓	✓	✓				
Detention Basin	Y	✓	✓	✓	✓			
Project Location								
Development Along Coastal Shoreline	N	✓	✓	✓	✓	✓	✓	
Development Near Floodplain	Y	✓	✓	✓	✓	✓	✓	
Development Near Existing Surface Waters/Wetlands	N							
Development Near Groundwater Resources	Y		✓			✓		
Development Near Protected Species or Habitat	N	✓	✓		✓	✓		
Construction Activities								
Surface Grading	Y	✓	✓	✓		✓	✓	✓
Earthwork Below Surface	Y	✓	✓					
Demolition	N		✓		✓	✓		
Construction in Surface Water	N	✓	✓	✓		✓		
Vegetation Clearing	N	✓	✓	✓		✓	✓	✓
Sediment and Storm Water Management	N	✓	✓	✓	✓	✓	✓	✓
Post-Construction Operational Activities								
Potential Exposure of Pollutants to Storm Water	Y		✓			✓	✓	✓
Industrial Activity	N	✓	✓	✓		✓	✓	✓
Deicing	Y	✓	✓	✓	✓	✓	✓	✓

Water Resource Issue Key:

1 Physical Impacts to Wetlands and Other Surface Waters
2 Surface Water and Groundwater Quality
3 Storm Water Quantity and Floodplains
4 Hazardous Wildlife Attractants
5 Aquatic Life and Habitat
6 Coastal Zones and Barriers
7 Wild and Scenic River

WORKSHEET 3

EXAMPLE **DOCUMENTATION: SUMMARY OF WATER RESOURCES INVENTORY INFORMATION FOR POTENTIAL SITE 1**

Water Resource Issue	Characterization Data Found in Inventory	Water Resource Found on/near Project Site	Extent / Location	Critical Features	Possible Project Impact (Y/N)
Physical Impacts to Wetlands and Other Surface Waters	Physical Extents, Classifications, and Values	Wetlands	2.5 acres on site	Category 1 Quality	Y
Surface Water and Groundwater Quality	Protected or Critical Resources, Classifications and Uses, Discharge Criteria	Little River	Receives water from unnamed ditch	Little upstream dilution	Y
Storm Water Quantity and Floodplains	Existing Infrastructure, Controls, Outfalls, Receiving Streams, Floodways, Flood Fringes	100-year floodplain	3.1 acres extends into potential site	Occupies 50% of site	N
Hazardous Wildlife Attractants	Open Water Surfaces, Agricultural Land Uses, Waste Disposal Areas	Potential Future Detention Basin	Potential exposed surface unknown at this time	To be constructed to manage storm water quantity	Y
Aquatic Life and Habitat	Identification of Habitat and Resources Used by Protected Species	Habitat for Spotted Ducks in adjacent Little River	Habitat area 300 feet along southern edge of site	May require tighter control of sediment discharges	Y
Coastal Resources	Designated Coastal Barrier Islands, Coastal Zone Boundaries	None	N/A	N/A	N
Wild and Scenic Rivers	River Classifications and Assigned Values	Big River	10 miles of Scenic River starting at confluence with Little River	Scenic River - has water quality criteria for temperature	N

WORKSHEET 4

EXAMPLE **DOCUMENTATION: SUMMARY OF APPLICABLE CORE REGULATORY REQUIREMENTS**

Water Resource Issue	Regulatory Agency	Potentially Applicable Regulations / Guidance	Applicable Standards	Project Issue	Notes on Regulatory Compliance
Physical Impacts to Wetlands and Other Surface Waters	USACE	CWA Section 404	Restrictions on Filling of Wetlands	Wetlands difficult to avoid as they intermittently cover site	< 0.5 acres require Nationwide Permit > 0.5 acres requires Individual Permit
Storm Water Quantity and Floodplains	City of Suburbia	Municipal Code - Storm Water Discharges	No change in peak flow for 100-year storm	Meeting peak flow criteria likely requires detention	Must get city approval on storm water management plan
Hazardous Wildlife Attractants	FAA	FAA AC 150/5200-33B: "Hazardous Wildlife Attractants on or Near Airports,"	No construction of detention basin on airport	Need basin. May need to cover unless offsite location found	May need Wildlife Hazard Management Plan
Surface Water and Groundwater Quality	State EPA	State Water Quality Standards	Dissolved Oxygen Ammonia	High BOD in runoff may result in need for storm water treatment	NPDES permit needed to determine effluent limits
Aquatic Life and Habitat	USFWS	Endangered Species Act, Section 7	No construction in duck habitat area	May require adjustment of site layout	Must demonstrate compliance under NEPA for USACE permit

APPENDIX B

Water Resource Issue Fact Sheets

Contents

Fact Sheet 1
Physical Impacts to Wetlands and Other Surface Waters

The water resource issue category "Physical Impacts to Wetlands and Other Surface Waters" encompasses the impacts of airport development projects on the physical characteristics of surface waters, including wetlands, and the associated permitting requirements. This fact sheet presents guidance on planning for and managing the issues associated with physical impacts to wetlands and other surface waters for airport development projects.

1.0 Description of Water Resource Issue and Impacts

Airport property may contain, or be adjacent to, wetlands or other surface waters such as streams, rivers, surface drainage ditches, or ponds. The infrastructure siting associated with new development projects often results in potential physical impacts to these resources, as well as to buffer zones surrounding the resources. Avoidance of these impacts is the top priority. Often in cases with limited available land, avoiding impacts is incompatible with the project function. Where impacts appear unavoidable, permits and mitigation measures are required. Unauthorized impacts to these resources could impact stream quality, water quality, biodiversity and biotic habitat, etc. or result in changes in wetland acreages, or runoff and floodplain characteristics.

Information on related water resource issues can be found in other fact sheets, as indicated below.

RELATED WATER RESOURCE ISSUES

Water Resource Issue	Relationship
Storm Water Quantity and Floodplains	Coordinate on the construction of structures within or over surface waters; stream excavation, dredging, or channelizing; and filling within wetland areas.
Surface Water and Groundwater Quality	Coordinate on the construction of structures within or over surface waters; stream excavation, dredging, or channelizing; and filling within wetland areas.
Hazardous Wildlife Attractants	Coordinate on stream excavation, dredging, or channelizing, as well as wetland or surface water mitigation locations and design criteria.

Water Resource Issue	Relationship
Coastal Zones and Barriers	Coordinate on the construction of structures within or over surface waters; excavation, dredging, or channelizing; and any filling within wetland areas.
Aquatic Life and Habitat	Coordinate on physical impacts to surface waters that may be associated with loss of habitat for biotic resources.

2.0 Identification of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the potential effects of physical impacts to wetlands and other surface waters from development projects to protect these resources and biotic habitats. Section 2 of this fact sheet provides the following:

- A summary of the surface water and wetland regulations associated with physical impacts typically applicable to airports
- A methodology for identifying the core regulatory requirements generally applicable to each airport locale

The discussion below focuses on federal regulations; check Chapters 20 and 21 of the FAA Desk Reference and with local agencies to determine if additional requirements may apply.

2.1 Summary of Core Regulatory Requirements

Federal rules for physical impacts to wetlands and other surface water resources date back to 1899 under the Rivers and Harbors Act, and were primarily derived to support commerce and agricultural development. The rules focused on large rivers and streams considered "navigable waters of the United States." Sections 9 and 10 of the Rivers and Harbors Act established a permit program for structures affecting or work conducted in navigable waters.

Section 404 of the Clean Water Act (CWA) established a permitting program under United States Environmental Protection Agency (USEPA) guidance for discharges of dredge or fill materials into "waters of the United States." If structures, work, or discharges of material are proposed for surface waters, including wetlands, a permit authorizing the activity may be required by the USACE before the activities commence. Permits may cover projects pursuant to both the Rivers and Harbors Act and the CWA.

The permitting program is regulated under 33 Code of Federal Regulations (CFR) 320-330 and permit issuance may be as a general or individual permit. General permits, or Nationwide Permits (NWPs), cover many similar types of activities or have limited thresholds for surface water length or wetland acreage impacts. Individual permits cover activity-specific projects or when threshold conditions listed for general permits are exceeded.

Prior to authorization of a Section 9, 10, or 404 permit, a Water Quality Certification under Section 401 of the CWA must be issued by the state to certify that the federal permit meets state water quality standards. Authorization may include region-specific conditions. Consultation must also take place with the United States Fish and Wildlife Service (USFWS) and other state agencies under the Fish and Wildlife Coordination Act (FWCA) when a project requiring a federal permit has the potential to affect fish and wildlife.

Actions that physically impact surface waters in coastal areas may be subject to the Coastal Zone Management Act of 1972 (CZMA), as amended by the Coastal Zone Management Reauthorization Amendments of 1990 (23 CFR 650.211) and the Coastal Zone Protection Act of 1996, and Coastal Barrier Resources Act of 1982 (CBRA), as amended by the Coastal Barrier Improvement Act of 1990. Actions that impact essential fish habitat (e.g., estuaries, coral reef, and inter-coastal areas) are also subject to Magnuson–Stevens Fishery Conservation and Management Act of 1976 (MSFCMA), under the authority of the National Marine Fisheries Service (NMFS). Refer to the Coastal Zones and Barriers Fact Sheet for further information on impacts to coastal resources.

Since federal agencies authorize Section 9, 10, and 404 permits, the requirements of NEPA apply. Typically, the United States Army Corps of Engineers (USACE) ensures NEPA requirements are met through the agency's internal permit approval process. However, in some situations other federal agencies, such as the Federal Aviation Administration (FAA) may decide to be the lead regulatory agency for the NEPA process.

Water quality based impacts to wetlands and other surface waters are covered by regulations other than those described above. Those issues are discussed in Fact Sheet 2 Surface Water and Groundwater Quality.

As discussed in Section 2 of the Handbook, it is recommended that airport representatives identify and document the core regulatory requirements associated with each water resource issue before planning begins. The figure below identifies a methodology for identifying those core requirements. The figure also includes references to commonly found results from that analysis.

TIPS FOR . . .
Identifying Core Regulatory Requirements

- Assess whether multiple entities have jurisdiction and seek guidance on overlapping and conflicting requirements.
- Coordinate with regulators in assessing whether general or individual permits and certifications for typical development projects are applicable to different types of airport development projects.
- Coordinate with regulators to clarify the timing of submittal requirements with respect to the design and construction processes.
- Coordinate with regulators and review regulatory guidance to determine the specific regulatory submittal requirements for the permit application process, including report documentation, calculations, and site plans.
- Identify mitigation ratios for surface water or wetland impacts.

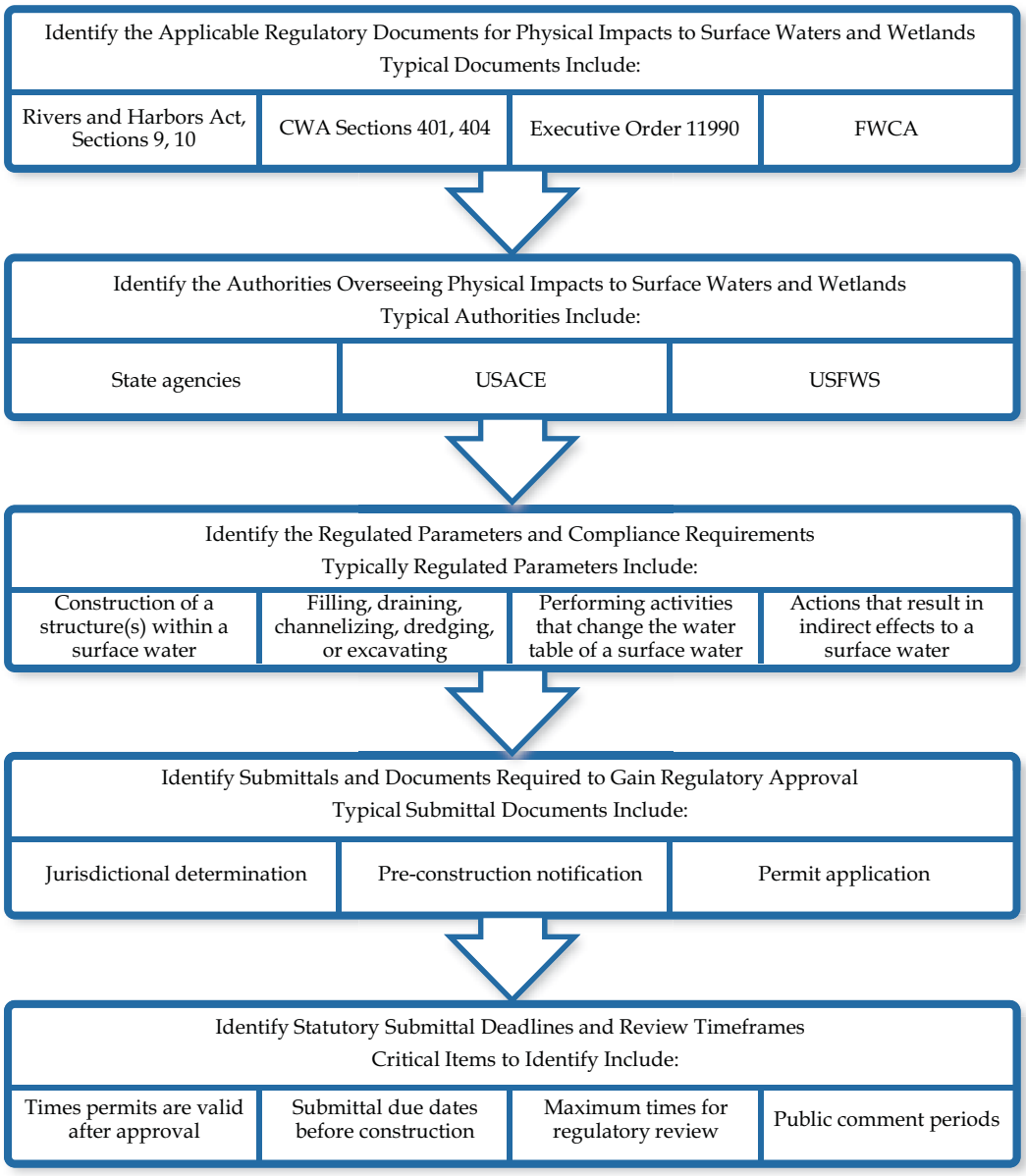
3.0 Determination of Measures Needed for Compliance

Section 3 of this fact sheet presents a methodology for determining the means of achieving compliance that is specific to each project.

3.1 Characterize Physical Impacts to Wetlands and Other Surface Waters

Characterizing the unavoidable effects of a development project on surface waters and wetlands requires an understanding of how the project affects the development site and an under-

PROCESS FOR IDENTIFYING CORE REGULATORY REQUIREMENTS



standing of the core regulatory requirements. Not all impacts to wetlands and other surface waters require a federal permit. The USACE determines if it has jurisdiction over a wetland or other surface water based on a site-specific analysis to determine if there is a significant "nexus," or connection, with traditional navigable water. Prior to determining if a federal permit is needed, it is important to confirm if the wetland or surface water is under the jurisdiction of the USACE. Those resources not covered under the USACE's jurisdiction include those that are not hydraulically connected to a navigable water. An example of a non-hydraulically connected surface water is an isolated wetland. Typically, impacts to these types of surface waters are authorized by state agencies.

If the wetland or surface water is under the USACE's jurisdiction, site-specific information must be obtained pertaining to the surface water's characteristics and how unavoidable actions

will physically impact the resource. Once the level of impacts is determined, the airport can identify if the action qualifies for a NWP or individual permit. Refer to Section 3.3 for information on avoiding/minimizing impacts. Additional information, such as cultural and biotic resources, and mitigation should be incorporated in applications.

In the event a project must be located in jurisdictional waters, the project footprint should be overlaid on a map of characterized wetlands and other surface waters to assess the potential impacts to the water resource. At conceptual planning stages an approximate acreage, or lineal feet, of impacts is suitable in most cases. Prior to submitting permit applications, more specific boundaries defined by geographic coordinates are usually necessary. The potentially impacted wetland acreage or stream length may need to be categorized by the quality of the impacted surface water.

3.2 Compare Project Effects to Regulatory Conditions

If surface waters are under the jurisdiction of the USACE, a permit may be needed prior to development. A review should be conducted for the proposed action, associated federal and regional permit conditions, and Section 401 Water Quality Certification requirements. If the review results in identifying impacts that are below regulatory thresholds, a permit is typically not required. If impacts are above regulatory thresholds, the review should help identify the type of permit needed for the project. Thresholds for wetlands are typically in terms of acres of wetlands that are impacted. Thresholds for streams and other navigable waters are typically in terms of lineal feet of the surface water that are impacted. It is important to note that although a permit from USACE may not be needed, a Water Quality Certification may still be required.

Regulatory conditions for impacts to biotic and cultural resources must also be evaluated. Depending on the type of biotic community or cultural resources present, regulatory requirements may necessitate the need for additional documentation or approvals prior to development.

3.3 Identify Required Controls and Modifications to Development Project

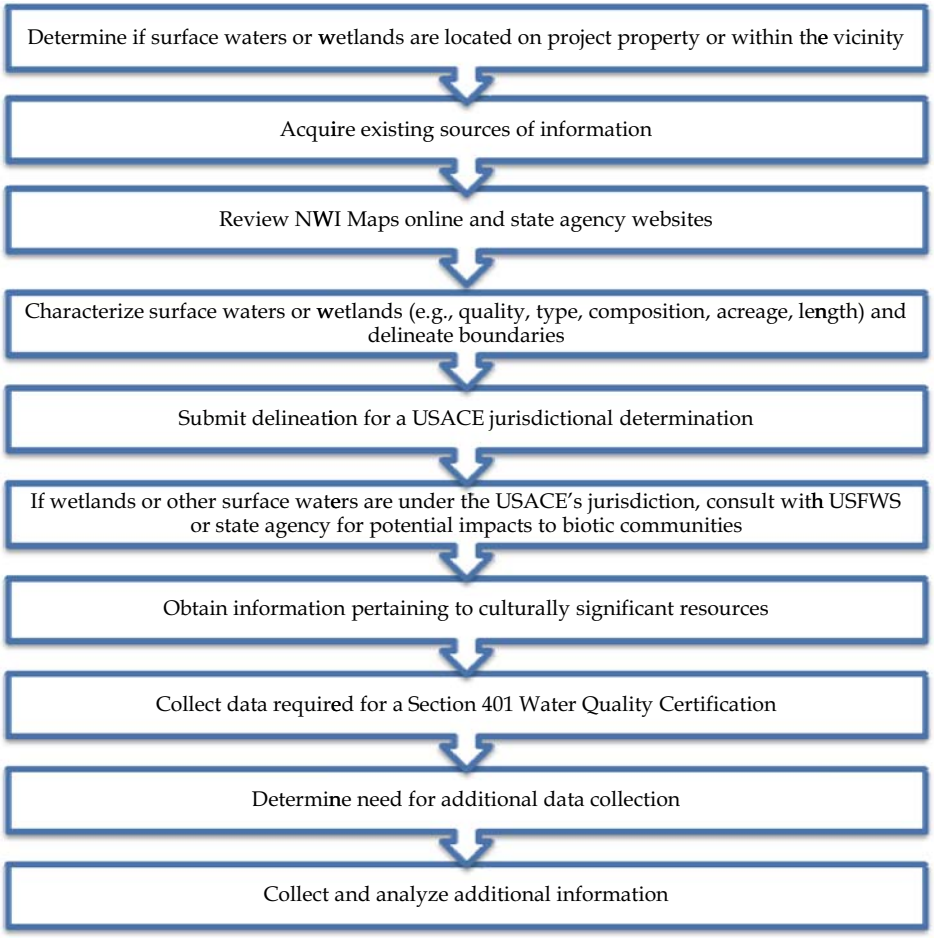
Federal agencies must evaluate the project and options to avoid or minimize impacts to wetlands and other surface waters. This requires airport operators to determine if the project can be relocated elsewhere to avoid physical impacts to wetlands and other surface waters. The review may result in the airport no longer needing a permit or other approvals for the project. If the project cannot be relocated, the airport must identify alternatives to minimize impacts.

Mitigation is required as a condition for some permit authorizations. It is important that the type of wetland or other surface water is adequately characterized so that impacts requiring mitigation are sufficiently identified. Impacts can be mitigated on or offsite. If impacts are planned to be mitigated offsite, typically a mitigation ratio is implemented. Mitigation acreages for wetlands or length of stream impacts may need to be calculated. For example, if 5 acres of wetlands are filled at the airport, the authorizing agency may require 10 acres of wetlands to be mitigated offsite (2:1 mitigation ratio).

3.4 Prepare and Submit Compliance Documents

Documentation requirements for permit approval depend on if the permit is a NWP or individual permit. In some cases, activities authorized by NWP may proceed without notifying the USACE. However, some NWP require advanced notification of the action and a pre-construction notification (PCN) must be sent to the USACE and state agency. Each NWP specifies the documentation needed for the PCN.

Recommended Steps for Characterizing Physical Impacts to Wetlands and Other Surface Waters



Individual permits require submittal of an application and associated documentation, which is reviewed by the USACE. The following information includes the documentation needed for individual permit applications:

- Completed and signed application form
- Project description
- Site plan
- Length of surface water impacts or acreage of wetland impacts
- Types and volumes of materials to be dredged or filled
- Method of dredging/filling and disposal methods
- Early agency correspondence
- Jurisdictional determination documentation and approval
- Avoidance or minimization of project impacts
- Options to meet mitigation requirements

A separate 401 Water Quality Certification may be required prior to NWP or individual permit approvals. Because state requirements for authorization under a 401 Water Quality Certification are varied, consult with your state agency to determine specific requirements pertaining to the approval process.

TIPS FOR . . .

Determining the Measures Needed to Achieve Compliance

- Acquire information on wetlands and other surface waters within the airport's boundaries from state agencies and the USACE.
- Include wetlands and other surface waters as part of an airport-wide Water Resource Inventory, and create a map of those within the airport's boundaries.
- As a means of reducing risk and balancing cost, prioritize which water resources should receive site-specific delineations and quality assessments in early planning by considering:
  - Project sites most likely to be used
  - Project sites that have the highest quality and extent of wetlands and other surface waters.
- In early planning, consider that "support" systems for the development project such as detention basins, treatment plants, or roads might themselves potentially lead to physical impacts.
- Adequately delineate stream and wetland boundaries to avoid impacting these resources without regulatory approval. Failing to get approval prior to impacts could result in fines or cease-and-desist orders, ultimately impacting project schedule and costs.
- Hold a pre-application meeting with regulators to help identify permit type and documentation needs, and actively engage them throughout the permit process.
- Ensure that application forms and supplementary documentation are complete when submitted and are received by the authorizing agency. This will help reduce delays due to missing information.
- Watch for changes to the project during its planning and design that might change the circumstances and conditions for regulatory actions, resulting in the need to reassess compliance status. Coordinate with regulatory agencies when preparing applications to obtain a common understanding of "complete."
- Review permit conditions and conduct work as specified in permit authorization, including standard conditions in NWP. Follow-up with any required documents, actions, inspections, etc.
- Determine if this water resource issue requires coordination with multiple regulatory agencies. There is sometimes significant political and community input to impacts associated with particular high-value resources, especially in coastal areas, which can cause significant delays in the NEPA process. If airports are aware of potentially significant public interest that may benefit by eliminating project alternatives that are unlikely to be approved.
- Identify agencies or public groups with special interests that may be involved with the approval process.
- Verify that potential mitigation options, including mitigation banks, are approved for such a use.
- Assess whether the process of complying with applicable regulations requires modification to existing permits or Storm Water Pollution Prevention Plans (SWPPPs).

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this fact sheet identifies the ways in which planning and management of physical impacts to wetlands and other surface waters can affect development project and project planning.

4.1 Siting and Construction of Development Project

Planning considerations for reducing the effect of compliance with regulations associated with this water resource issue on the development project features and mitigation measures are provided below.

- Relocation of some, or all, of the project to avoid wetland or surface water impacts must be considered to meet regulations and/or as a result of significant public input. If alternative sites would not meet project needs, explain why impacts to wetland or waters are unavoidable.
- In some cases, portions of a project may need revision of project function or scope to avoid or minimize wetland or surface water impacts. Flexibility of development project features and characteristics will allow for more opportunities to adapt to regulatory constraints as they arise.
- When assessing sites in early project planning phases, the presence of wetlands, especially high quality wetlands, should be a significant factor in the decision-making matrix.
- If multiple projects are foreseen that may impact surface waters or wetlands, use of offsite mitigation banks owned by a third party or design and construction of an airport's own offsite wetland or surface water mitigation project should be considered to minimize the cost and schedule implication associated with project-by-project mitigation.
- Airport operators will need to coordinate with regulatory agencies regarding a potential need to mitigate within the same watershed as the impact, as well as consider the potential for hazardous wildlife attractants associated with mitigation near the airport.

4.2 Airport Operations

Achieving compliance with regulations associated with physical impacts to wetlands and other surface waters is typically less influenced by post-construction airport operations than other water resource categories. Methods for reducing operational impacts associated with the integration of the development project planning with surface water and wetland compliance planning are provided below.

- Use of onsite mitigation for wetlands and other surface waters is frequently preferred by environmental regulators, but is a significant concern for airports because of the potential wildlife attractant threat. The airport's policies and position on wildlife attractants and those of the FAA (as noted in FAA AC 150/5200-33B (9) and the Memorandum of Agreement dated July 2003 (36)) should be clearly presented to the regulatory authority governing the mitigation decision.
- The need to move or modify a development project can result in the desired operational levels not being reached.
- The need for monitoring and maintenance of surface water and wetland mitigation sites following construction can add fairly significant costs and should be a consideration in assessing total project costs.

4.3 Schedule and Sequencing

The process for assessing, demonstrating, and implementing compliance measures for physical impacts to wetlands and other surface waters can be lengthy and integrally related to the planning, permitting, design, and construction of the development project itself. Items that typically have the most significant impact on schedule are shown in the table below.

The sequencing of these activities in relation to the development project is critical. Failure to adequately identify and collect the data needed for permit applications can be a significant setback in the ability to stay on schedule. Failure to integrate the permitting, design, and construction schedules for the controls with the permitting, design, and construction schedule for the development project can have cascading impacts on schedule as well.

In most cases, the process for acquiring permits and approvals will overlap to some degree with the implementation of compliance measures and the overall development project implementation process. It is important to acquire project-specific schedule information from regulators, environmental compliance staff and consultants, design engineers and construction personnel to prepare an overall schedule that effectively integrates and sequences the project steps.

For complex projects, the process for obtaining permits can be a multi-year process. Generally, the following approval process is conducted for NWP requiring PCNs:

- Prepare and submit PCN.
- USACE 30-day review period.
- Perform activity after 30-day review period or unless otherwise notified by the USACE.

Generally, the following approval process is conducted for individual permit applications:

- Prepare and submit permit application form.
- USACE application completeness review.
- Public notice within 15 days of receipt of a complete application.
- 15-30 day comment period.
- Public comments submitted to applicant.
- Applicant submits response to comments within 30 days.
- USACE receives Water Quality Certification from state agency.
- Permit issued or denied within 60 days of receipt of complete application.

Generally, the following approval process is conducted for Section 401 Water Quality Certifications:

- Prepare and submit certification application.
- State agency completeness review.
- USACE coordinates with state agency.
- State agency issues 401 Water Quality Certification.
- Permit issued or denied by USACE.

4.4 Project Costs

It is important to account for costs associated with data collection needs, agency negotiations, or mitigation associated with the compliance process. To minimize costs, it is recommended that airport operators identify any surface waters or wetlands in the vicinity of the airport during the Conceptual Planning Phase or even before development is conceived, as part of a site-wide inventory or broader Water Resource Inventory. The knowledge gained from this effort can help to inform decisions about project siting when development projects are in the early planning phases.

Coordination should begin with potential regulatory agencies as soon as the project team is aware that there may be potential impacts for a particular project and some level of definition can be provided to potential impacts. This may begin as early as the Conceptual Planning Phase. Agency discussion or review can take up to several months to complete to ensure project goals are met and the authorizing agency is satisfied with the project design. Consultation with the agencies can also help to minimize impacts to surface waters and wetlands.

When it comes to avoiding, minimizing, or mitigating for potential impacts, it is important for airport operators to consider all the options available to them, including combinations of

project modifications and on or off-site mitigation, to identify the solution that might be most cost-effective for their particular application. Mitigation requirements for project impacts can also be very costly, especially if mitigation is conducted offsite at a regulator-approved mitigation bank.

GUIDANCE FOR . . .
Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Water Resources Inventory	Prepare water resources inventory for use on multiple projects.
Permit Acquisition and Approval	Limit impacts if possible to utilize NWPs rather than individual permits where applicable to minimize schedule and reduce preparation costs.
Design Development	Provide alternatives that avoid or minimize impacts to surface waters or wetlands and design projects that do not incorporate unique engineering or construction practices.
Development Revenue	Account for gained or lost revenue (e.g., parking) from changes if project function or scope must change to achieve compliance.
Schedule and Sequencing	Recognize that schedule changes usually equate to cost increases for consultation, design, and construction.
Staffing	Identify the expertise needed, select qualified experts, and bring them in at the right time to avoid re-doing work.
Stakeholder Coordination	Seek to understand cost considerations raised by stakeholders such as airlines and various airport departments. Coordinate early with stakeholders such as airlines, regulators, various airport departments, and communities to avoid multiple iterations of permitting and design. Plan for early and ongoing coordination with regulators (pre-application meeting).
Delineation	Adequately delineate stream and wetland boundaries using required methods, preferably with an airport wide delineation to reduce time commitments on individual projects.
Documentation	Submit complete notifications and applications.
Mitigation	Consider enhancements to existing wetlands or surface waters to get mitigation credit rather than construction of new wetlands or surface water segments. Be sure the mitigation does not affect aviation safety.
Start of Work	Verify that federal agencies have fully completed activities and issued permits and approval before construction.

Fact Sheet 2
Surface Water and Groundwater Quality

The water resource issue category "Surface Water and Groundwater Quality" encompasses the impacts of airport development projects on the quality of surface waters and groundwater. Although surface waters and groundwater can be considered differently in a regulatory context, they share similarities from a development project perspective and are therefore considered jointly in this fact sheet. This fact sheet presents guidance on planning for and managing surface water and groundwater quality issues associated with airport development projects.

1.0 Description of Water Resource Issue and Impacts

1.1 Overview of Surface Water Quality

Surface water can include streams, rivers, lakes, wetlands, harbors, territorial seas, waters of the contiguous zone, and oceans. "Surface water," as a regulatory term, may have varying interpretations and has the potential to be confused with terms such as "waters of the United States," "waters of the state," or "navigable waters." Court rulings have clarified these distinctions to some degree.

Surface water quality is a broad term that is associated with maintaining the beneficial use of surface waters as it relates to pollutant levels and their effects. A variety of narrative and numeric measures have been developed to classify beneficial use designations and surface water quality standards. A central aspect of managing surface water quality issues is that it is primarily a local issue, meaning that specific characteristics and regulatory designations of individual surface waters have a significant impact on the challenges and means for compliance with regulations.

In general, airport development projects, such as deicing pads, deicer application areas, or fueling areas, can affect surface water quality as a result of changes in characteristics affecting storm water, pollutants associated with changes in operations, or construction activities. Therefore, both construction and post-construction operations need to be considered when managing surface water quality issues during development project planning. Construction-related issues are often associated with sediment management (dissolved and total solids) and erosion control, but also include fuel and petroleum management to prevent spills. Post-construction operational issues can be associated with new or additional material handling in the developed areas, changes in storm water quantities that change pollutant concentrations or loading rates in nearby surface waters, and changes in the locations to which pollutants are discharged to the receiving waters.

Pollutants contained in storm water and process water discharged during construction or operations have the potential to affect human health, aquatic life, aquatic habitat, and other designated uses of the receiving waters. The characteristics of the receiving waters, their regulatory status, and the water quality criteria defining compliance all affect the relative significance of the surface water quality issue that is encountered.

1.2 Overview of Groundwater Quality

Groundwater is a natural resource that is relied upon as a source of drinking water for the vast majority of rural communities and approximately half of the population in the United States (*1*). It also serves as a water supply for a large number of industries and agricultural applications. Supply, contamination, and public health are major issues associated with groundwater resources. The public became increasingly aware of the potential for and significance of groundwater contamination in the 1970s and 1980s, as over 200 different chemical contaminants were identified in groundwater resources.

Above ground and underground contamination sources can impact groundwater quality. Contaminants on the surface may mix with surface runoff and enter groundwater by percolation through soil, infiltration in aquifer recharge areas and outcroppings, and fissures or cracks in the ground or along well casings. Underground sources of contamination may directly enter an aquifer or may permeate through the soils before entering the groundwater source. Once within an aquifer, the contaminants may form a plume, which may or may not migrate downstream with groundwater flows. The migration of the plume will depend on the amount, type, density, and solubility of the contaminant, as well as groundwater flow characteristics. Contaminated groundwater resources have the potential to also contaminate downstream surface water resources, leading to potential ecological impacts.

Potential airport development sources above ground that may impact groundwater are primarily associated with airport operations, including deicing and anti-icing, maintenance, chemical storage and handling, and pesticide and herbicide application. Other potential sources of groundwater contamination include construction activities, spills and emergency releases of hazardous substances, leaking storage tanks or surface impoundments, agricultural activities, waste disposal sites, leaking sewers and septic tanks, leach fields, underdrains, and underground injection wells or infiltration galleries for storm water runoff or other fluids.

Information on related water resource issues can be found in other fact sheets, as indicated below.

RELATED WATER RESOURCE ISSUES

Water Resource Issue	Relationship
Wild and Scenic Rivers	Wild and Scenic Rivers regulations encompass protection of surface water quality in rivers carrying those designations.
Physical Impacts to Wetlands and Other Surface Waters	Coordinate on physical impacts such as dredge and fill potentially impacting groundwater. Coordinate on state and local regulatory requirements for these impacts.
Storm Water Quantity and Floodplains	Changes in storm water quantities from development areas during and after construction can change pollutant concentrations and loads, even if no new pollutant source exists. Coordinate on storm water controls with infiltration components.
Coastal Zones and Barriers	Coordinate on coastal aquifers and salt water intrusion–related issues.

2.0 Identification of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the potential effects of changes to surface water and groundwater quality from development projects. Section 2 of this factsheet provides the following:

- A summary of the principal surface water and groundwater quality regulations typically applicable to airports.
- A methodology for identifying the core regulatory requirements applicable to each airport locale.

2.1 Summary of Surface Water Quality Core Regulatory Requirements

Water quality regulations are typically designed to reduce or eliminate the discharge of pollutants and to protect beneficial uses of receiving waters such as water supply, recreation, aquatic life, and agriculture. Surface water quality is governed primarily through the Clean Water Act (CWA) and a number of federal regulations designed to implement the CWA for specific water quality issues and situations. The CWA is the principal federal law governing water pollution. It prohibits discharge of pollutants from point sources to waters of the United States without a permit. Regulated discharges under the CWA include direct discharges to waters of the United States. Discharges to municipal separate storm sewers that have a direct connection to waters of the United States may also be regulated under the CWA. Of particular historical interest to airports is the fact that storm water discharges were not specifically addressed under CWA until the Water Quality Act of 1987.

The CWA includes six titles. Three of the titles have particular importance to a high level understanding of the CWA provisions for airports.

2.1.1 Title III—Standards and Enforcement

- Requires discharge permits
- Establishes technology-based standards program
- Establishes water quality-based standards program
- Establishes authority for the United States Environmental Protection Agency (USEPA) to issue administrative orders against violators and seek civil or criminal penalties

2.1.2 Title IV—Permits and Licenses

2.1.2.1 Section 401—Water Quality Certification

- Section 401 requires a water quality certification from the USEPA or designated states before issuance of a federal permit to ensure that the proposed discharge is consistent with the CWA.

2.1.2.2 Section 402—NPDES Program

- National Pollutant Discharge Elimination System (NPDES) permits must be obtained for construction projects affecting one or more acres or part of a larger common plan of development, and for airports with industrial storm water discharges associated with material storage, fueling, deicing, and maintenance.
- Facilities either apply for an individual NPDES permit or for coverage under a general permit if their operations or discharges fall under an available general permit.
- NPDES permits may include numeric limitations, narrative requirements, as well as allowances or requirements for Best Management Practices for controlling pollutant loads, often specified in Storm Water Pollution Prevention Plans (SWPPPs.)
- USEPA has delegated authority to implement the NDPES program in most states. Regional USEPA offices implement the program in the remaining states.

2.1.2.3 Section 403—Ocean Discharge Criteria

- Regulates discharges to territorial sea, waters of the contiguous zone, and oceans and includes protection of human health and welfare as well as marine life

2.1.2.4 Section 404—Placement of Dredge and Fill Materials

- Regulates placement of dredged or fill materials in waters of the United States (see Fact Sheet Physical Impacts to Surface Waters and Wetlands for additional description of Section 404).

Several other laws govern surface water quality-related issues, including:

2.1.3 Safe Drinking Water Act—42 United States Code (U.S.C.) 300f

- Established to protect drinking water by regulating surface water and groundwater drinking water sources
- Prohibits the use of federal financial assistance for a project that would contaminate the recharge zone for a sole source aquifer

2.1.4 Oil Pollution Act of 1990—33 U.S.C. 2702 (OPA)

The Oil Pollution Control Act is an amendment to the CWA designed to prevent and respond to oil spills. As regulated under 40 CFR 112, the OPA includes the following requirements important to airports:

- Applies if a facility has an oil storage capacity that exceeds 42,000-gallons of underground storage capacity, or 1,320-gallons of above ground storage capacity.
- Includes oil stored in tanks, drums, mobile refuelers, oil-filled transformers, hydraulic oil reservoirs for elevators.
- Excludes permanently closed tanks, motive power tanks (tanks on vehicles and aircraft), underground storage tanks (USTs) regulated by Part 280 or a Part 280 state programs, and containers less than 55 gallons.
- Requirements of this regulation that may affect airport development include:
  - Develop and implement an SPCC Plan
  - Provide sized secondary containment for oil storage containers
  - Provide general secondary containment
  - Requirements for new USTs, and upgrades to existing USTs
- If an airport stores over 1,000,000 gallons of oil, it may be required to develop a Facility Response Plan (FRP).

Discharges from airports to surface waters potentially are covered under several aspects of CWA and associated regulations, including:

- Storm water discharges from areas of industrial activity for airports covered under Standard Industrial Classification (SIC) code 45.
- Storm water discharges into municipal separate storm sewer systems (MS4s) whose discharges are regulated under the CWA.
- Storm water discharges from areas of construction activity disturbing one or more acres of land.
- Discharges to Publically Owned Treatment Works (POTW), whose discharges are regulated under the CWA.
- Effluent Limit Guidelines (ELG), which are nationally applicable standards for surface water discharges for certain categories of discharges. For example, airports with development projects that disturb 10 or more acres are subject to numeric discharge limits under the Construction and Development Category.

2.2 Summary of Groundwater Quality Core Regulatory Requirements

Federal regulation of groundwater quality primarily originated with the CWA. The CWA regulates groundwater that is connected to surface water. Section 102 of the CWA calls for comprehensive programs to be developed at federal, state, and local levels to reduce, eliminate, and prevent groundwater contamination. Many states have provisions for groundwater protection, which may include areas tributary to aquifer recharge areas. The NPDES program, which requires permits for discharges to surface water, includes discharges with the potential to impact groundwater. Other

groundwater provisions in the CWA include dredge and fill operations and water quality criteria that limit particular land uses and development (*2*).

The Safe Drinking Water Act of 1974 (SDWA), as amended in 1986 and 1996, further protects groundwater used as an Underground Source of Drinking Water (USDW). The SDWA authorized the EPA to ensure that drinking water sources are safe for human consumption. The SDWA led the EPA to establish Maximum Contaminant Levels (MCLs), or maximum concentrations of contaminants in drinking water supplies, and several programs for protecting USDWs:

- Wellhead Protection Program (WHP): requires states to develop their own WHP, as well as establish protection areas around wells to minimize the potential for contamination of USDWs (*1*).
- Sole Source Aquifer (SSA) Program: prohibits federal funds from being used on a project that may contaminate a sole or principle USDW for an area, or its recharge area (*3*). This program allows for the establishment of Critical Aquifer Protection Areas (CAPAs) (*1*).
- Underground Injection Control (UIC) Program: permit program that regulates the design, operation, inspection, and monitoring of five classes of injection wells used to store or dispose of fluids underground to protect USDWs. Hazardous waste injection requires coordination under RCRA.
- Source Water Assessment (SWA) Program: EPA can provide grants to individual states to develop programs for protection of groundwater resources. EPA must report to Congress every three years on the quality of groundwater resources.

As the public awareness of the extent of groundwater contamination increased over time, additional regulations were established to focus on the control of sources of contamination, including solid and hazardous waste disposal sites, spills and emergency releases of contaminants, pesticides and herbicide use, and sanitary waste. Drinking water standards are used to determine groundwater protection requirements under a number of these other statutes.

The Resource Conservation and Recovery Act of 1976 (RCRA), an amendment to the Solid Waste Disposal Act (SWDA), as amended in 1996, regulates the treatment, storage, and disposal of hazardous and non-hazardous wastes. It includes provisions for protecting groundwater from contamination due to landfills, USTs, surface impoundments, and hazardous waste facilities. The provisions include monitoring requirements, liners and containment systems, and spill detection systems. The 1984 Hazardous and Solid Waste Amendments to RCRA (HSWA) expanded the RCRA requirements by including requirements for reducing the toxicity of wastes (*1*). Additional RCRA amendments in 1992 and 1996, respectively, strengthened enforcement authority at federal facilities and provided additional regulatory flexibility for land disposal of wastes. RCRA restrictions also include the location for waste facilities based on hydrogeological conditions, and corrective actions to address significant changes in groundwater quality.

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Superfund) provides a federal "Superfund" and authorizes the federal government to clean up contaminated sites, including those with the potential to endanger drinking water supplies. The 1986 Superfund Amendments and Reauthorization Act (SARA) reauthorized CERCLA to continue cleanup activities (*4*). CERCLA and Superfund are designed to protect human health and the environment, with a major goal being to restore contaminated groundwater to beneficial use and meet drinking water standards where practicable and appropriate (*5*). Groundwater protection and restoration provisions are included in the monitoring and response activities performed under CERCLA by states.

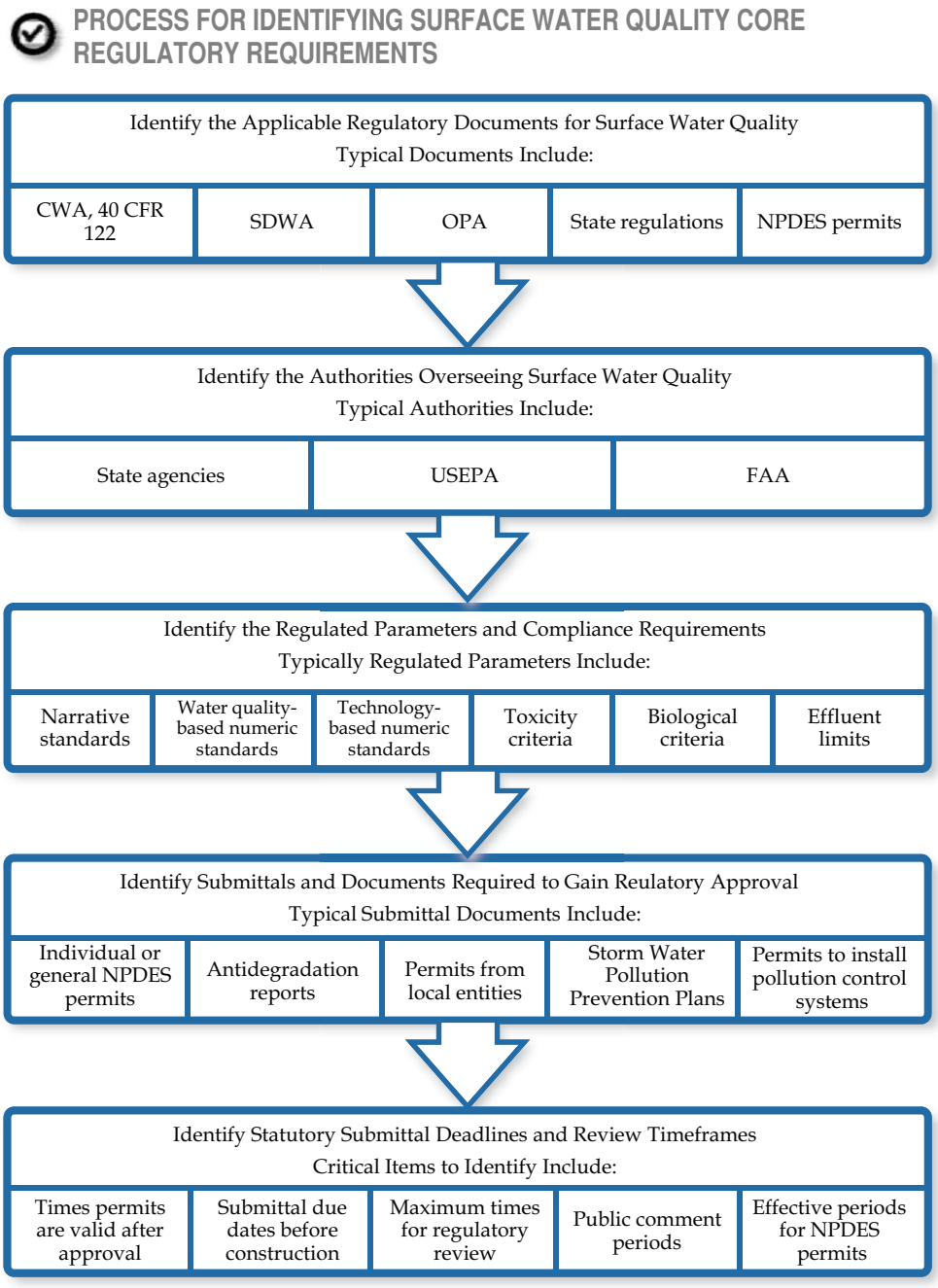
Other federal regulations, including the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA), as amended in 1972, and the Toxic Substances Control Act of 1976 (TSCA), as amended in 2002, provide indirect protection measures through regulation of chemicals with the potential to contaminate groundwater.

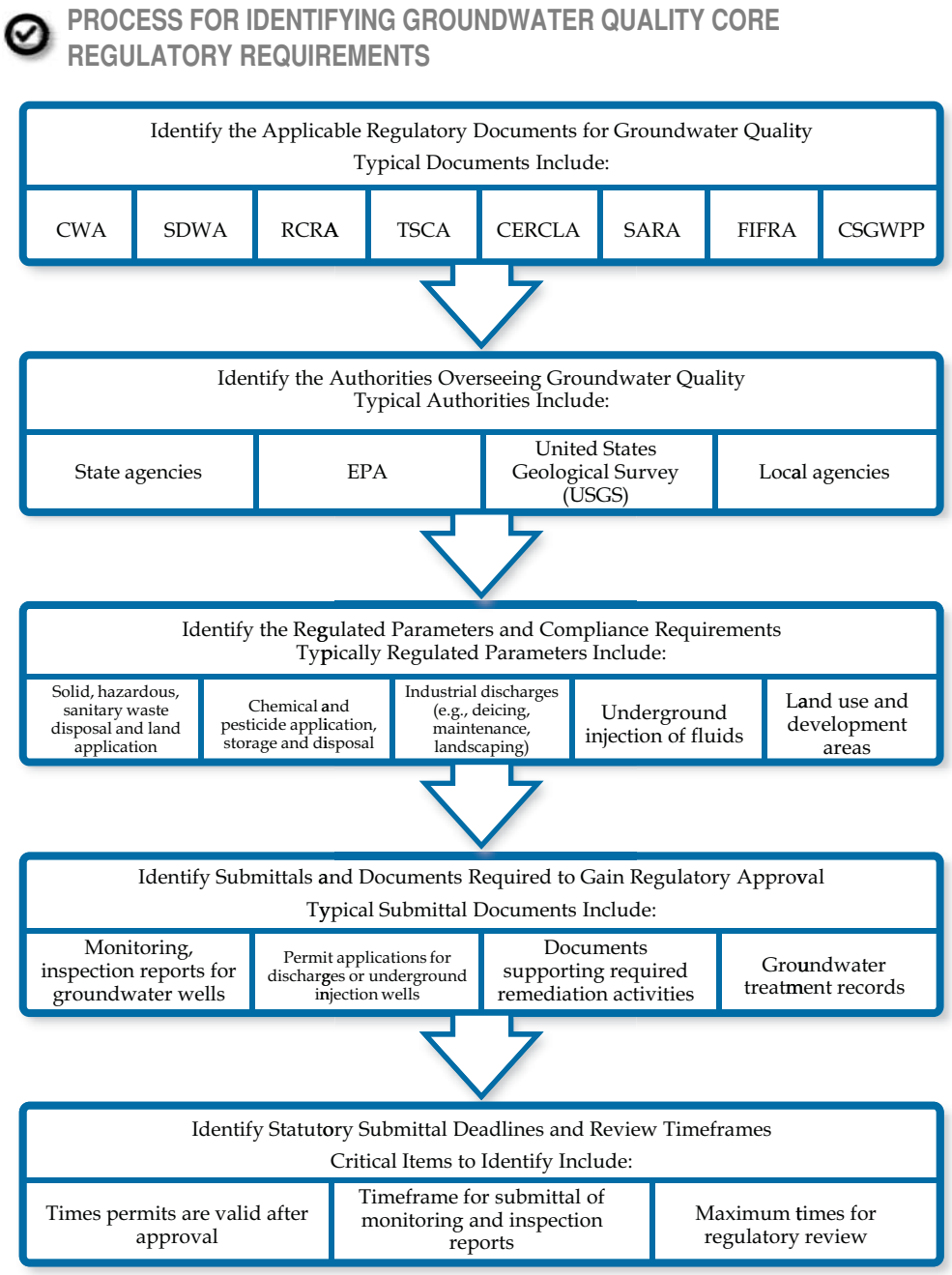
In 2006, the Ground Water Rule (GWR) was established as part of compliance with the 1996 Amendments to the CWA, and called for regulations for disinfection of groundwater drinking

water supplies. The objective of the GWR is to reduce public health risk and incidence of disease associated with disease-causing microorganisms in groundwater that is a source of drinking water. The GWR applies to public water systems that serve groundwater and a combination of surface water and untreated groundwater. It does not apply to public water systems that combine groundwater and surface water prior to treatment. As this rule regulates public water supplies, it may not be applicable for new development at airports.

Many states, working with local municipalities, have developed or are in the process of developing Comprehensive State Ground Water Protection Programs (CSGWPPs), which may include some or all of the following components:

- Groundwater use classification
- Localized water quality criteria to supplement federal criteria





- Land use management
- Funding for implementation of program and cleanup efforts
- Requirements for discharge permits and underground injection

In addition to the components above, states may be responsible for implementing regulations for USTs and pesticides.

As discussed in Section 2 of the Handbook, it is recommended that airport representatives identify and document the core regulatory requirements associated with each water resource issue before planning begins. The preceding figure identifies a methodology for identifying those requirements. The preceding figure also includes references to commonly found results from that analysis.

TIPS FOR . . .
Identifying Core Regulatory Requirements

- When assessing the core regulatory requirements for surface water quality that are potentially applicable to your airport, review surface water compliance history at airport, including past NPDES permits, permit applications, SWPPPs, SPCC plans, facility response plans, NPDES discharge monitoring reports, water quality studies, public meeting records, and correspondence with agencies. If the information is not readily available, request the information from your regulator. These documents may contain much of the information needed to document the core requirements.
- Use experts with a detailed understanding of surface water and groundwater quality regulations, as well as experience in coordinating with the applicable regulators, to identify or review the core regulatory requirements.
- Many state agencies, as well as USEPA, have information available online summarizing regulations and their applicability.
- Assess whether multiple entities have jurisdiction and seek guidance on overlapping and conflicting requirements.
- Coordinate with regulatory authorities early and often to identify potential impacts, required permits and approvals, and potential project modifications or mitigation measures. Particularly, coordinate on requirements for compliance with groundwater statutes related to USDWs and source water protection programs, SSAs, WHPs, subsidence due to over-pumping of aquifers, and salt water intrusion.
- Acquire information on water quality studies that have been performed in the airport's watershed, through, for example, a regulator's Total Maximum Daily Load (TMDL) program. This information can provide guidance on local water quality issues and future water quality standards.
- Seek a clear and common understanding of the meaning and applicability of regulated surface waters with state and local regulators.

3.0 Determination of the Measures Needed for Compliance

Section 3 of this factsheet presents a methodology for determining the means of achieving compliance that is specific to each project.

3.1 Characterize Project Effects

3.1.1 Surface Water Quality

Assessing project-specific surface water quality compliance requirements requires an understanding of the characteristics of the discharges to surface waters. This characterization can be complex because a large number of potential pollutants may be involved and because their characteristics may vary widely.

Some discharge characterization data may be available from existing information, such as NPDES Discharge Monitoring Reports. For projects involving changes to pollutant characteristics, collection of additional field data may be required. Collection and assessment of the field data adds costs and increases the time required to execute the project. For certain activities such as deicing, characterization data on discharges can be obtained from calculations or models of the pollutant sources and routing of the pollutants through the storm water drainage system.

The collected data characterizing storm water discharges is submitted in applications for NPDES permits. It is used in assessing whether the discharges have a reasonable potential to exceed potentially applicable effluent limits.

3.1.2 Ground Water Quality

Characterizing the effects of a development project on groundwater quality requires an understanding of how the project could affect groundwater and the core regulatory requirements.

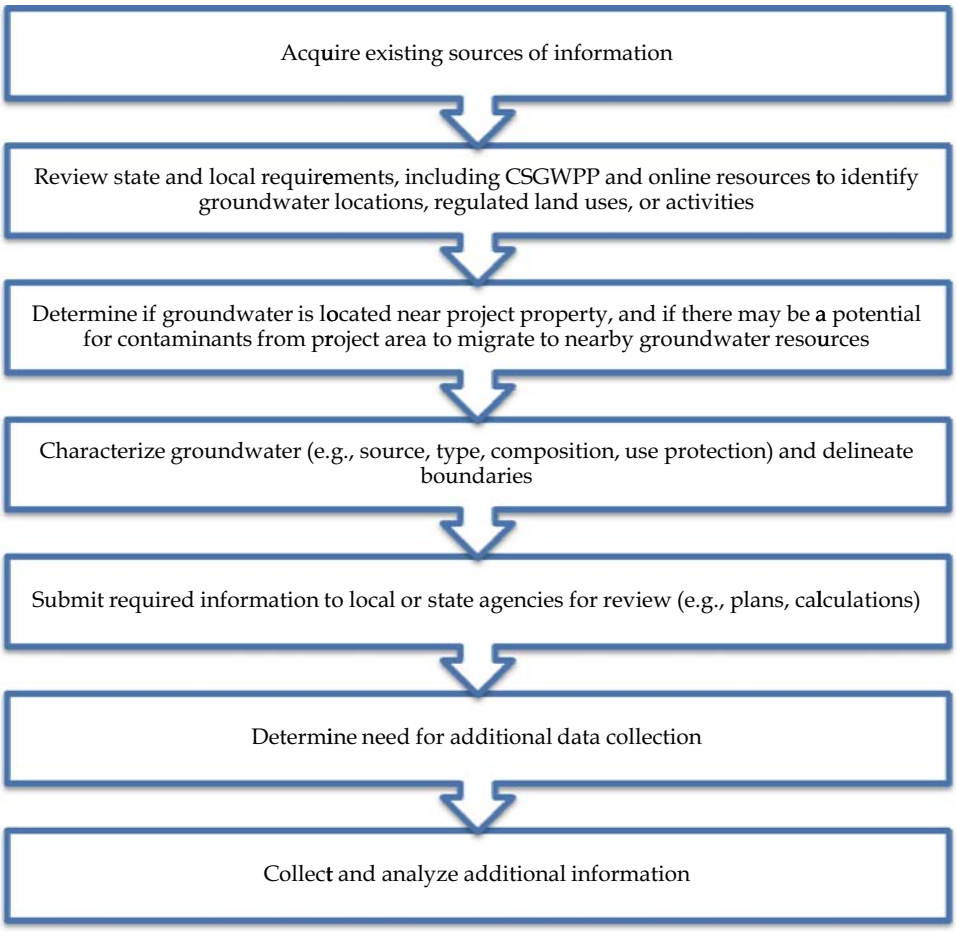
The location and extent of groundwater resources in the vicinity of the project and airport must be identified to characterize potential project effects. Particular attention should be paid to USDWs and source water protection areas, drinking water supply well locations, sole or principle source aquifers and CAPAs, and delineated recharge areas. Examples of typical information sources needed to identify this information includes:

- CSGWPP or other local and state groundwater requirements, including groundwater provisions in surface water quality statutes
- Project features and land uses that may be regulated and potential threats to groundwater quality
- USDWs and protected groundwater features, including wellhead protection areas and sole source aquifers
- Site studies and surveys
- Regulatory agency documentation and mapping of protected groundwater resources and restricted development areas

Although the specific requirements will vary from one locality to the next, the project characteristics that may impact groundwater quality include:

- Land application/runoff from pesticides, herbicides, pavement cleaners, or other exposed or land-applied materials
- Aircraft/pavement deicing/anti-icing activities, including application, collection of runoff, and treatment or disposal of runoff
- Maintenance activities and potential for spills or emergency releases
- Chemical storage, handling, and disposal, including above ground storage tanks (ASTs) and USTs
- On-site sanitary waste disposal methods (e.g., septic tanks, leach fields)
- Solid and hazardous waste collection and disposal
- Project location, footprint, and depth
- Soil and drainage characteristics, including general infiltration characteristics, and flow patterns and destinations associated with proposed industrial activity locations
- Underground injection or shallow disposal wells, including infiltration BMPs for storm water runoff, well casings located near proposed operational areas, or other potential avenues for groundwater contamination due to surface runoff
- Runoff controls, collection and treatment systems, pollution prevention BMPs and protocols, leak detection systems, personnel training, and spill response plans
- Areas using pervious pavement

Recommended Steps for Characterizing Project Effects on Groundwater Quality



3.2 Compare Project Effects to Regulatory Conditions

3.2.1 Surface Water Quality

Effluent limitations and other conditions associated with discharges are specified in NPDES permits. For some development projects, the existing limits and monitoring conditions will be applicable and no additional assessment of effluent limits is needed. For other development projects, new limits and monitoring conditions may be required. Typical drivers for new effluent limits and permit conditions include:

- New types of materials used in the areas of industrial activity that result in new types of pollutants in the discharges to surface waters
- Changes in the quantity of existing materials that increase the loading and concentration of existing pollutants in the discharges to surface waters
- Changes in flow rates that change the pollutant loadings or concentrations in the discharges to surface waters
- New outfalls or outfall locations
- Newly applicable regulatory standards triggered by the development or coincident with the development such as anti-degradation–based restrictions, limitations based on TMDLs, or effluent guidelines

Once the potentially applicable effluent limitations or water quality standards have been determined, the project effluent quality is compared to the potentially applicable effluent limitations in what is typically referred to as a reasonable potential analysis. From this analysis, the regulatory authority determines which pollutants have limitations, the numeric value of those limitations, the statistical basis for the limits (e.g., daily maximum, monthly average) and the monitoring requirements for limited pollutants and non-limited pollutants.

3.2.2 Groundwater Quality

Assessing compliance with groundwater quality regulatory conditions will vary somewhat depending on local and state regulations. Airports may need to consider whether proposed project features or activities are in compliance with groundwater statutes and if controls or modifications are necessary to comply with these statutes. Development projects at airports must also comply with local, state, and federal regulatory conditions associated with planned land uses or project features with the potential to endanger groundwater quality.

3.3 Identify Required Controls and Modifications to Development Project

3.3.1 Surface Water Quality

Should the projected effluent quality exceed the effluent limits, or other restricting conditions, mitigation measures may be needed to achieve compliance with the limits. Those measures typically could include:

- Reductions in material use
- Best management practices to control pollutants near the point of contact with the storm water
- Changes to material use areas
- Low impact development and other local controls to promote "natural" pollutant degradation or reduction
- Discharge of portions of the pollutant-impacted storm water to sanitary sewers
- Collection and recycling of materials contributing to pollution prior to discharge
- Collection and on-site treatment of pollutant-impacted storm water

Implementation of the measures can require significant infrastructure, including:

- Piping systems
- Pump stations
- Tanks or basins
- Control systems
- Treatment systems

An airport activity that often requires control measures involving significant infrastructure for many airports is aircraft deicing. Pavement deicing, sediment management, and fuel system management may also require significant infrastructure. Other activities leading to implementation of control measures at airports could include vehicle washing, vehicle parking, pavement cleaning, chemical storage, and other maintenance activities.

3.3.2 Groundwater Quality

Airport operators will need to continue coordination with regulatory authorities to determine the conditions for compliance. Many of the regulatory conditions include controls for groundwater quality protection. For example, projects with proposed USTs will need to comply with applicable state and federal UST regulations. Requirements for CERCLA may apply to inactive or abandoned sites with soil or groundwater contamination and require mitigation for cleanup.

It may be necessary to identify and incorporate measures for protecting groundwater quality or for controlling or treating potential sources of contamination prior to development. Modifications may be required to change the project location to avoid impacts to a groundwater resource, or to revise or eliminate particular project activities or migration pathways with the potential to endanger groundwater quality.

3.4 Prepare and Submit Compliance Documents

3.4.1 Surface Water Quality

Management of surface water quality issues for new or re-development projects involves a series of regulatory documents, some of which are listed below. Check with the regulator to determine which documents require applications or other submittals, and which documents simply need to be maintained on the site for potential review. It is typically the responsibility of the airport operator, or its designated representatives, to prepare these documents.

- NPDES permit (application required)
- Anti-degradation application and report
- Water quality studies for receiving stream
- Reports on potential impacts to biology or habitat
- Notice of intent for coverage under General Permits
- SWPPP for Industry Activity
- SWPPP for Construction Activity
- SPCC Plan
- FRP
- Discharge Monitoring Reports
- User permit for discharge to sanitary sewer
- Permits to Install or construct for water pollution control equipment, possibly including submittal of design or construction documents (application required)
- Environmental Impact Statement or Environmental Assessment

3.4.2 Groundwater Quality

Specific requirements for documenting and demonstrating compliance will likely vary significantly from one locality to the next, depending on local programs and statutes. Additionally,

potential airport development impacts to groundwater quality are typically evaluated under the National Environmental Policy Act (NEPA). A variety of permits, approvals, and assessments may also be required for proposed land uses and project features that are associated with the potential impacts to groundwater quality (e.g., permits for underground injection wells, sanitary waste disposal methods, and solid or hazardous waste disposal, submittal of design calculations or construction documents).

Whether complying with local statutes or the NEPA process, airports should generally anticipate the need to document local groundwater resources, potential sources of groundwater contamination, and potential controls and protection measures.

TIPS FOR . . .

Determining the Measures Needed to Achieve Compliance

- Include surface water and groundwater resources in an airport-wide Water Resource Inventory, and create a map of those within the airport's boundaries.
- Identify protected groundwater resources in the vicinity of the airport. Airport operators should become familiar with the existence of USDWs, including SSAs and WHP areas.
- Determine the beneficial uses for all potential receiving waters in the early stages of planning to minimize potential issues with the designated quality (e.g., high quality) of receiving waters.
- Determine if new development projects will result in additional pollutant load (e.g., pounds of pollutants per day) to receiving waters or in other changes to the discharge that would trigger compliance with applicable anti-degradation regulations. In an anti-degradation review, justifications for changes to the discharge that trigger anti-degradation requirements must be made to the regulatory agency on a social, environmental, and economic basis. The anti-degradation review can lengthen project schedules and could result in the need for additional control infrastructure or development project changes.
- Identify surface waters downstream or adjacent to the airport that are fed by groundwater resources to gage cumulative effects of modifications to groundwater.
- Consider impacts to water bodies (e.g., lakes, other streams) that have downstream confluences with airport receiving streams. These may also be affected by airport discharges and can potentially have more stringent water quality standards than the initial receiving waters.
- Consider the potential for groundwater impacts associated with the infiltration of storm water runoff potentially containing pollutants.
- Manage or contain areas of contaminated groundwater to help prevent downstream impacts to surface waters.
- Take an active role in developing NPDES permit conditions through coordination with the regulatory authority. Effective interaction with the agencies can help improve understanding of the issues and streamline the time to develop permit applications and develop permit conditions.
- Recognize that airport discharges can contain limitations derived from a variety of regulatory standards and requirements and that the most stringent limitations apply.

- Review the details of the permit conditions, such as effluent limitations in NPDES permits (e.g., concentration vs. load-based limits, frequency of monitoring, sampling type), and conduct work as specified in permit authorization. An understanding of these conditions can result in more efficient development and operation of pollution control facilities. Follow-up with any required documents, monitoring, actions, and inspections.
- Coordinate on compliance with surface water quality statutes with groundwater provisions, possibly including source water protection under SDWA, as well as NPDES and 401 requirements under CWA.
- Assess whether development projects are creating "new sources" under technology-based regulations. Classification of a project as a new source may trigger more restrictive discharge conditions.
- Anticipate the need to consider the location and extent of project features and proposed airport operations in relation to the location and extent of groundwater resources. It may be necessary to compare these relative locations to any regulatory separation criteria.
- Consider whether changing project criteria, including revisions to project footprint or location, or controls that meet regulatory criteria is more cost effective than controls for managing ground water quality.
- Consider that decisions made on how to manage surface water quality issues can affect groundwater.
- Determine whether permits are required to install or construct pollution control equipment. Hold a pre-application meeting with regulators to help identify permit type and documentation needs, and actively engage them throughout the permit process. Incomplete application forms or permits not obtained in a timely fashion can delay the start of construction projects.
- Verify with regulators that potential mitigation options are available and feasible. Watch for changes to the project during its planning and design that might change the circumstances and conditions for regulatory actions, resulting in the need to reassess compliance status.
- Eliminate project alternatives that could result in significant political and community input on impacts, which can cause significant delays in the NEPA process and are unlikely to be approved.
- Assess whether the process of complying with applicable regulations requires modification to existing permits or Storm Water Pollution Prevention Plans.

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this factsheet identifies the ways in which surface water and groundwater quality issue planning and management can affect development project and project planning.

4.1 Siting and Construction of Development Project

Planning considerations for reducing the effect of surface water and groundwater quality compliance on the development project features and control infrastructure are provided below.

4.1.1 Surface Water Quality

- The location of a development project within the airport watershed can impact the degree to which surface water quality management becomes a significant issue. Planning activities with significant pollutant impacts in areas with stringent effluent limitations can threaten the viability of the project or lead to significant control systems. Options for modifying the project to avoid this situation should be explored.
- Consideration should be given to the location of the development project relative to the location of the water quality controls. Conveying water significant distances to reach pollution control facilities can require compromise in the project layout and disrupt other airport infrastructure.
- Pollution control systems for storm water, especially for deicing-driven controls and sediment controls, can require significant amounts of space for storm water storage. These storage needs should be considered early in the project development. Efforts should be made to reduce the volumes of impacted storm water.
- The mechanisms needed to manage sediment and prevent erosion should be considered well before construction for large construction projects, especially those covering large lineal areas like runways. In some cases, it may be advantageous to use structures designed for long-term storm water quantity or quality management (i.e., post-construction) for sediment control during construction.

4.1.2 Groundwater Quality

- Use soil probing, sampling, or drilling techniques, and piezometers or wells to characterize groundwater in advance of construction and allow for long-term monitoring of groundwater potentiometric surfaces, flow rates, or groundwater.
- Relocation of the entire project, such as a leach field, to avoid groundwater quality impacts may be necessary in some cases if potential impacts to public safety are identified. Having alternate sites for the development project, if feasible, may reduce delays if a change is made.
- In some cases, only portions of a project may need revision of project function or scope to avoid or minimize groundwater quality impacts. For example, eliminate planned project features or land uses that are associated with particular groundwater statutes (e.g., underground injection or land disposal activities). Flexibility of development project design will allow for more opportunities to adapt to regulatory constraints as they arise.
- When assessing sites in early project planning phases, the presence of groundwater resources, especially drinking water sources, should be a significant factor in the decision-making matrix. Airports should also identify prohibited land uses, protected resources, and criteria to maintain minimum horizontal and vertical separation distances surrounding these areas.
- Development areas with existing contamination plumes should be avoided. If these sites are necessary for development, mitigation should be conducted and reviewed with regulatory agencies. If it is necessary to pursue development near a potentially contaminated area, coordinate with regulatory agencies on options for development that will not exacerbate or may even help to remediate the issue (e.g., use of liners to prevent infiltration of storm water runoff in the area, or implementation of controls).
- Modify design of drainage system or utilities (e.g., rerouting of conveyance, use of flow diversion techniques, or relocation of outfalls) to prevent potential drainage or leakage to protected groundwater.

4.2 Airport Operations

Achieving compliance with surface water and groundwater quality regulations may be integrally related to airport operations on the new development and airport operations on existing developments. The operational impacts need to be considered early in the development project implementation process, especially for operations associated with deicing and fueling. Planning

considerations for reducing the effect of surface water and groundwater quality compliance on the post-development airport operations are provided below.

4.2.1 Surface Water Quality

- Most large development projects are based on projected changes in aircraft operations and passenger activity many years into the future. The surface water quality analysis, including assessment of compliance and control equipment should be considered on a similar timeframe.
- Allow all affected stakeholders to provide input on the timeframes and basis for future operational projections affecting surface water quality.
- In some cases, it may be significantly advantageous to sacrifice some airport operational objectives in exchange for reduced cost, size, and complexity of surface water quality compliance.

4.2.2 Groundwater Quality

- The need and costs for monitoring, sampling programs, and maintenance of structural controls, collection, and treatment systems following construction during early planning.
- Changes to locations and protocols for proposed airport operations (e.g., use of dedicated deicing pad or specialized deicing equipment or techniques) may reduce project impacts and control needs.
- Use of best management practices, specialized protocols, and trained personnel to apply, store, handle, and dispose of chemicals and pesticides may reduce project impacts and control needs.

4.3 Schedule and Sequencing

4.3.1 Surface Water Quality

The process for assessing, demonstrating, and implementing compliance measures for surface water quality can be lengthy and integrally related to the planning, permitting, design, and construction of the development project itself.

The sequencing of these activities in relation to the development project is critical. Failure to adequately identify and collect the data needed for calculations and design can be a significant setback in the ability to stay on schedule. Failure to integrate the permitting, design, and construction schedules for the controls with the permitting, design, and construction schedule for the development project can have cascading impacts on schedule as well.

In most cases, the process for acquiring permits and approvals will overlap to some degree with the implementation of compliance measures and the overall development project implementation process. It is important to acquire project-specific schedule information from regulators, environmental compliance staff and consultants, design engineers, and construction personnel to prepare an overall schedule that effectively integrates and sequences the project steps.

For complex projects, the process for implementing surface water quality compliance measures can be a multi-year process.

4.3.2 Groundwater Quality

The primary schedule components associated with groundwater quality issues include:

- Identification of potentially applicable regulations at local, state, and federal levels
- Identification of groundwater resources, including restrictions such as protection areas and separation criteria
- Regulatory coordination
- Identification of controls, modifications, and mitigation measures
- Permitting and approvals
- NEPA process

Groundwater resources near the airport can be identified well in advance of planning for future development. Airports can become generally familiar with the existence of groundwater protection programs and protocols at local and state regulatory levels, so that they are aware of any potential restrictions on land uses, development, or potential airport operations at the developed site.

4.4 Project Costs

Complying with surface water and groundwater quality regulatory requirements can result in significant capital costs associated with the development project as well as long-term costs to the airport once operations on the development areas have begun.

4.4.1 Surface Water Quality

Capital costs for the surface water quality controls may not necessarily correspond directly to the capital costs for the development project. Often, the water quality standards associated with the receiving waters and the effluent limits play a significant role in the costs.

4.4.2 Groundwater Quality

Major costs associated with groundwater quality regulations generally include the development of project modifications or controls to minimize impacts, construction controls, permitting and regulatory coordination, and the NEPA process. Additionally, once a groundwater supply has become contaminated, it can be very costly and difficult, if not impossible, to return to beneficial use. Contaminated groundwater resources are generally associated with significant costs including cleanup efforts, monitoring, liability issues, public health issues, and the identification and development of alternative water sources.

GUIDANCE FOR . . .
Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Water Resources Inventory and Data Collection	Establish baseline data to use on multiple projects. Include an assessment of surface water and groundwater resources in the water resources inventory. Require detailed field assessments to determine potential project threats to the resources.
Characterization of Discharges	Obtain buy-in from all stakeholders on the baseline data for future pollutant discharges.
Modeling, Calculations, and Analyses	Submit modeling plan to regulators for approval in Detailed Planning Phase.
Wasteload Allocation Analysis for Assessing Water Quality-Based Effluent Limits	Have airport representatives perform the calculations for assessing receiving stream assimilation capacities and allowable effluent limits to submit to regulator for review.
Risk Assessments	For potential discharges to ground water, consider performing a risk assessment to determine the likelihood of an impact to drinking water supplies, and compliance criteria that may limit this risk.

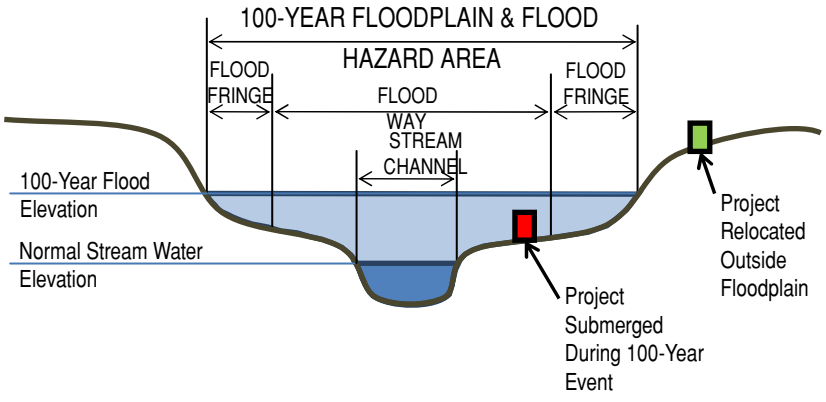
Item	Factors that Can Reduce Cost and Shorten Schedule
Control Siting	Consider potential land areas needed for storm water storage and treatment in Conceptual Planning Phase. Locate development project in areas that will not impact surface or groundwater resources.
Unintended Impacts	Review changes to the quality and quantity of infiltrating storm water when managing storm water quantity and surface water quality issues. Verify that compliance requirements associated with surface water quality for one development project do not inadvertently trigger additional compliance requirements for other areas.
Design Implementation	Provide alternatives that avoid or minimize impacts to surface water or groundwater, and design projects that do not require unique engineering, construction, or monitoring needs.
Mitigation	Recognize that future mitigation or cleanup of contaminated groundwater can be far more costly than managing impacts during project development.
Permit Acquisition	Define NPDES permit limits and conditions in Detailed Planning Phase to avoid planning and design changes. Submit permit to install applications as far in advance of construction as possible once design documentation is available.
Staffing	Realize that experts in development project design may not necessarily have expertise in surface water quality assessment and control implementation.
Schedule and Sequencing	Plan for water quality controls to be implemented and tested several months before they are needed to process discharges. Coordinate with development project construction.
Storm Water Management	Seek to minimize the volume of storm water that must be managed to achieve compliance.
Design Development	Perform detailed cost analyses that consider both capital and operating costs when considering treatment alternatives for storm water containing pollutants.
Stakeholder Coordination	Seek to understand regulatory conditions specific to local surface and groundwater resources. Identify with regulators if permits or other approvals or submittals may be required. Coordinate with stakeholders such as airlines, regulators, various airport departments, and nearby communities to avoid multiple iterations of permitting and design.

Fact Sheet 3
Storm Water Quantity and Floodplains

The water resource issue category "Storm Water Quantity and Floodplains" encompasses the impacts of airport development projects on changes to storm water flow quantities and floodplain characteristics and the associated effects on water resources and public safety. This fact sheet presents guidance on planning for and managing storm water quantity and floodplain issues associated with airport development projects.

1.0 Description of Water Resource Issue and Impacts

The quantities of storm water discharged from an airport into local receiving waters and the degree that those receiving waters extend into floodplains during high flow conditions can be a significant issue for airports during implementation of development projects. Storm water quantity, as used in this fact sheet, is a term that describes the effects of parameters such as flow rate, flow velocity, flow volume, and the relative timing of storm water discharges from various drainage areas on downstream water resources. A floodplain is the area adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current (see figure below). For airport purposes, FAA uses the 100-year floodplain to determine floodplain encroachments and impacts.



Floodplains protect structures and activities outside of the floodplain by absorbing the excess storm water entering waterways associated with heavy precipitation and runoff events. Improperly managed storm water quantity and floodplain parameters can affect public safety, water resources, biotic habitat, agricultural lands, and infrastructure integrity. These detrimental effects, specified below, can be both internal and external to the airport.

- Flooding
- Changes to floodplain characteristics and boundaries

- Stream scouring and erosion
- Damage to biotic habitats and stream hydro-morphology
- Sedimentation in receiving waters
- Damage to storm water conveyance, storage, and water quality structures

Compliance with regulations related to storm water quantity and floodplains can directly affect the process of implementing development projects in several ways, including:

- Restrictions on construction within the 100-year floodplain
- Changes to the development project characteristics to minimize changes in storm water quantities
- New infrastructure needed to comply with regulations restricting peak flow rates, flow volumes, and flow velocities

In turn, many of the most common airport development projects can affect storm water quantity and floodplains by changing the characteristics of airport surfaces and water conveyance infrastructure. Airports are frequently located near water bodies containing floodplains that extend onto airport property or extend onto properties that an airport may consider purchasing. For some airports, floodplains can constitute a significant portion of the potentially available development land. Airport surface features commonly affected by development projects include the location, elevation, slopes, areas, and infiltration characteristics of pervious and impervious (e.g., paved) surfaces. Airport drainage infrastructure characteristics commonly affected by development projects include the locations, elevations, and dimensions of piping and drainage structures (e.g., manholes and catch basins). Changes to these airport features can affect storm water infiltration rates, localized surface storage, water conveyance pathways, and characteristics of airport runoff. These changes subsequently affect the flow rates, velocities, quantities, timing of storm water discharges at airport outfalls, floodplain elevations, and adjacent land use characteristics.

Information on related water resource issues can be found in other fact sheets, as indicated below.

RELATED FACT SHEETS

Water Resource Issue Fact Sheet	Relationship
Hazardous Wildlife Attractants	Some storm water management facilities, such as detention basins, or floodplain modifications may create new hazardous wildlife attractants or exacerbate an existing wildlife hazard.
Surface Water and Groundwater Quality	Changes in storm water quantities from development areas can also affect discharged pollutant loadings and concentrations. Development inside a floodplain can change pollutant types and concentrations. Changes in quantities can affect the floodplains and their natural processes for improving water quality. Storm water quality mitigation measures may be needed in conjunction with storm water quantity mitigation measures.
Physical Impacts to Wetlands and Other Surface Waters	Wetlands often exist inside of floodplains; therefore, impacts to a floodplain may also impact wetlands. Some potential floodplain controls, such as using fill to raise an elevation, may have detrimental affects to surface waters, and therefore require additional mitigation.

Water Resource Issue Fact Sheet	Relationship
Coastal Zones and Barriers	Modifications to floodplains may impact coastal resources; therefore, mitigation controls may need to consider coastal management as well as floodplain regulations.

2.0 Identification of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the potential effects of changes to storm water quantity and floodplains from development projects on water resources, public safety, and infrastructure. Section 2 of this fact sheet provides the following:

- A summary of the principal storm water quantity and floodplain regulations typically applicable to airports
- A methodology for identifying the core regulatory requirements applicable to each airport locale

2.1 Summary of Storm Water Quantity Core Regulatory Requirements

Whereas storm water quality has been regulated primarily at the federal level, regulatory control of storm water quantity associated with development projects has primarily occurred at municipal, regional, state, and federal levels. Storm water quantity regulations are frequently written for general development projects, not specific to airports. The regulations are typically designed to protect infrastructure and minimize flooding during large, infrequent storm events. In some cases, the regulations are also designed to protect streams during smaller, more frequent, storm events.

Storm water quantity regulations take a variety of forms, but frequently incorporate the following conditions:

- Limits on certain end-of-pipe storm water quantity-based discharge parameters
- Requirements for specific end-of-pipe storm water quantity controls
- Requirements for implementation of low impact development drainage features that promote infiltration and evapotranspiration

Many of these requirements are related to development regulations at the local level. These local regulations are not covered specifically in this Handbook, but are addressed in general terms.

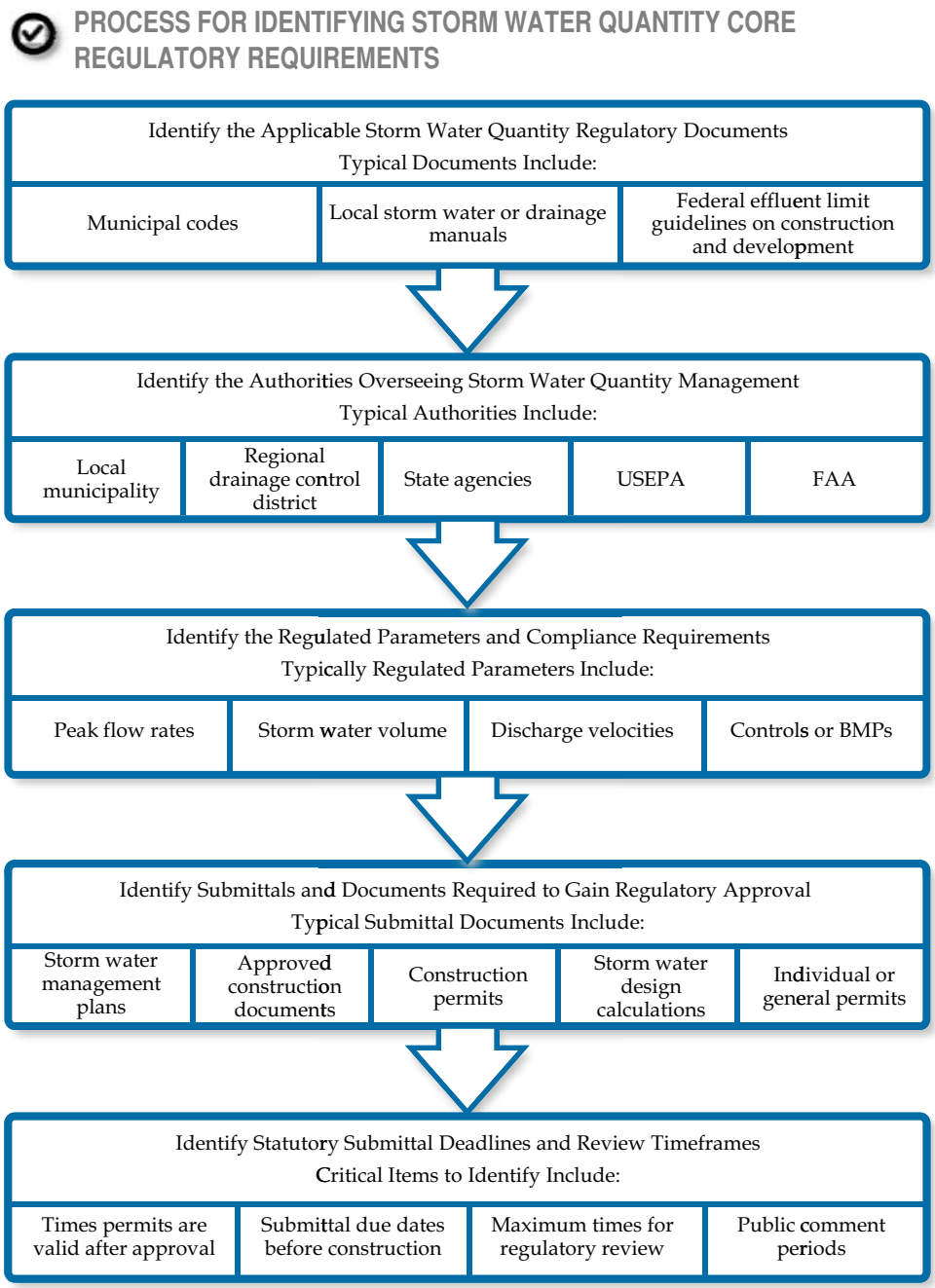
On the federal level, an Effluent Limit Guideline that became effective February 1, 2010 for construction and development activities may affect storm water quantity management at airports. This is applicable beginning August 1, 2011 to all sites that disturb 20 or more acres at one time and applicable February 2, 2014 to all sites disturbing 10 or more acres. While the rule is primarily focused on water quality improvement, implementation of control measures such as detention basins could affect storm water quantity management as well.

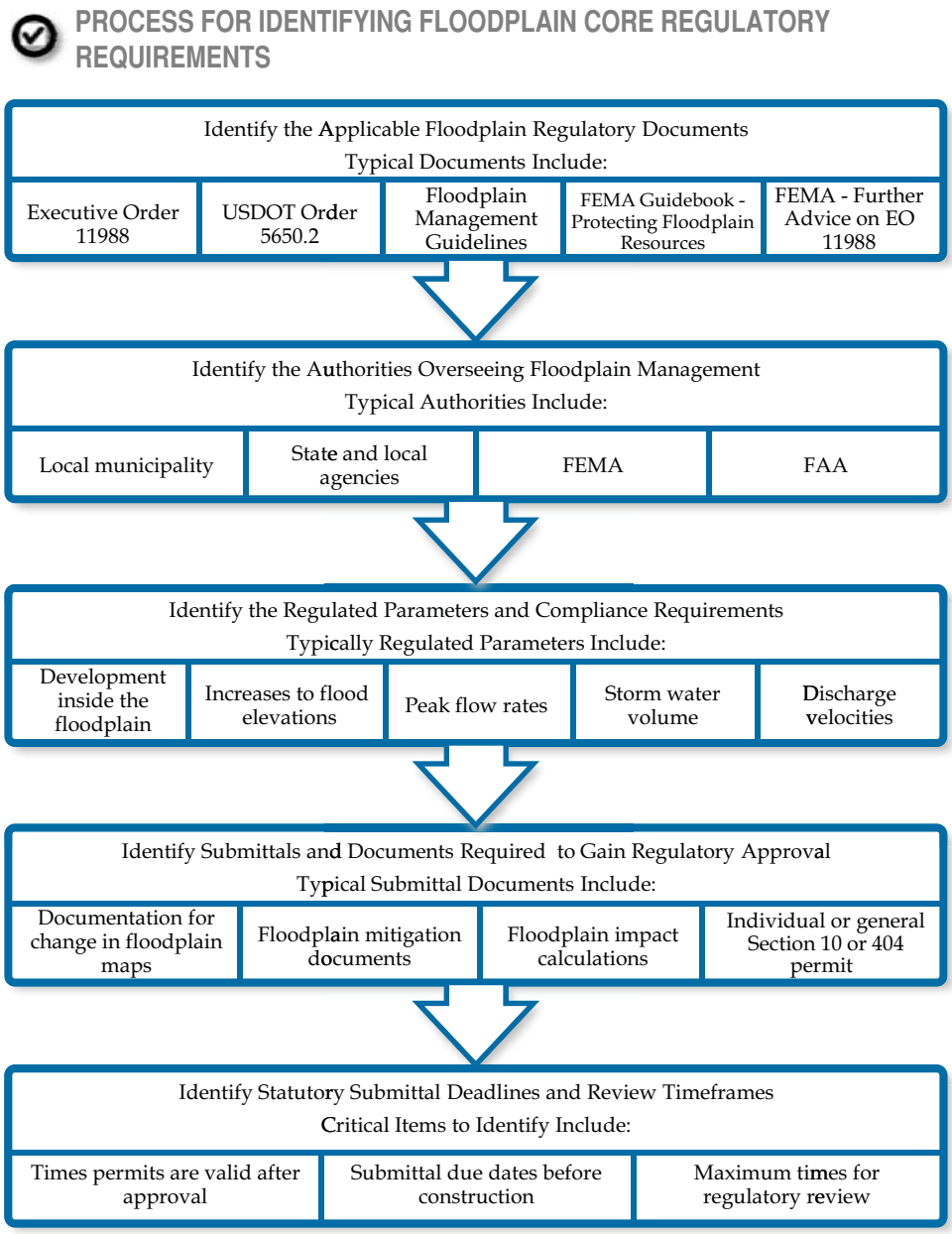
2.2 Summary of the Floodplain Core Regulatory Requirements

A series of federal orders and guidelines have been enacted and developed to protect floodplains. Some states, as well as regional and local authorities, also have regulations and guidance regarding actions affecting floodplains. The key elements of the regulatory framework include developments within a floodplain, increases to flood elevations, and changes to runoff inside the floodplain.

The federal regulations and guidelines derive primarily from Executive Order 11988. The United States Department of Transportation (USDOT) developed policies for carrying out the Executive Order in USDOT Order 5650.2. The Federal Emergency Management Agency (FEMA) has issued guidance to comply with the Order. Together, these Orders and guidance provide the criteria for floodplain management needed to achieve the following objectives:

- Preserve and restore natural and beneficial values from floodplains
- Reduce risks to human safety
- Ban activities in floodplains unless there is no practicable alternative
- Mitigate for floodplain impacts





For airports, oversight of floodplain activities is provided by the Federal Aviation Administration (FAA), under USDOT and the Federal Emergency Management Agency (FEMA). State or local floodplain regulations may also specify requirements for items such as freeboard for structures or roads, setbacks for structures from watercourses or the floodplain, measures to preserve natural areas in floodplains, or limits on development impacts. The current regulations limit the ability to construct new developments within floodplains. Some agencies may not allow any development inside of a floodplain.

For the most part, the regulations governing the quantities of storm water that are discharged and floodplains will be consistent from project-to-project at a given airport. To facilitate effective planning and minimize rework, it is recommended that airport representatives research and identify the core regulatory requirements for storm water quantity and floodplains. From this research, a checklist of key information can be documented, including the applicable regulatory references, regulating entities, requirements to obtain permits and approvals, and the regulated

parameters. That checklist can then be used to create a common framework from which the storm water quantity and floodplains issues associated with each development project can be assessed.

The two figures preceding below identify the methodology for identifying the core regulatory requirements associated with storm water quantity and floodplain management on development projects at airports.

TIPS FOR . . .
Identifying Core Regulatory Requirements

- Utilize individuals familiar with local regulatory requirements and federal floodplain requirements to assess applicable requirements for your project.
- Review storm water drainage manuals from local regulators in detail, which typically include important compliance criteria.
- Assess whether multiple entities have jurisdiction and seek guidance on overlapping and conflicting requirements.
- Coordinate with regulators in assessing whether storm water quantity and floodplain regulatory conditions written for general development projects are applicable or suitable to airport development and redevelopment projects. For example, regulatory requirements for detention may create a wildlife hazard attractant, which may conflict with airport safety requirements and policies.
- Coordinate with regulators to confirm acceptable methods, software, and submittal formats for calculations and modeling efforts.
- Determine if there is a need to assess storm water management and floodplain effects for a broader area beyond the development projects. For example, it may be necessary to consider other areas that are tributary to the same receiving stream or floodplains, or to evaluate effects on receiving waters downstream of the airport.
- Incorporate storm water management and floodplain controls into the National Environmental Policy Act (NEPA) process.

3.0 Determination of the Measures Needed for Compliance

Section 3 of this fact sheet presents a methodology for determining the means of achieving compliance that is specific to each project.

3.1 Characterize Project Effects

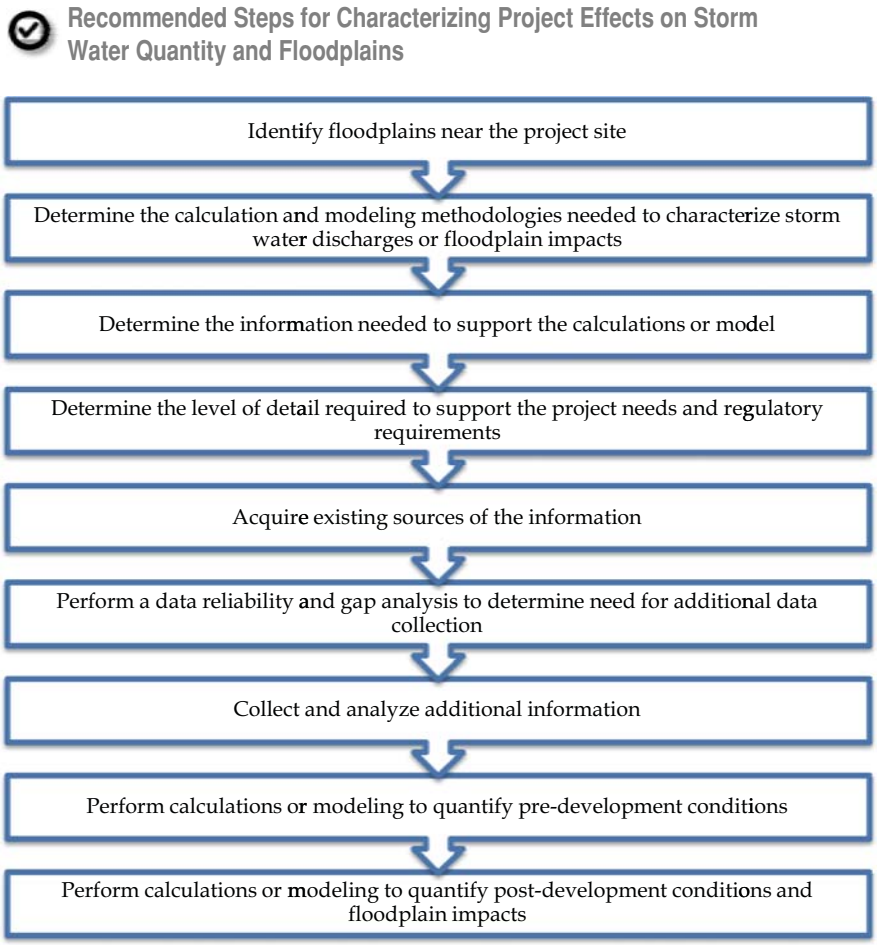
Assessing project-specific storm water quantity and floodplain compliance requirements can require significant amounts of information and calculations to characterize project effects on water resources. Information must be gathered on the project, the project site, local climate, and floodplains in the vicinity. Changes to storm water runoff, even if the projects are outside of the floodplain, have the potential to change to floodplain boundaries if controls are not implemented.

Some of the information may be readily available to an airport, but often additional collection of field data is required. Collection and assessment of the required data add costs and increase the time required to execute the project. Calculations, including computer models, are needed to characterize the effects of the development project on discharged storm water quantities and floodplain

B-36 A Handbook for Addressing Water Resource Issues Affecting Airport Development Planning

boundaries. Storm water runoff quantities are calculated in response to precipitation (hydrologic calculations). Storm water discharge quantities are calculated through the routing of runoff from various drainage areas through drainage infrastructure (hydraulic calculations). The runoff rates and quantities are frequented calculated in response to specific "design storms," often identified in the regulations, which specify storm duration and precipitation intensity. For complex systems, especially those involving multiple drainage areas, the modeling can be complex and time consuming. Information to help characterize project effects may be obtained from the sources identified below:

- Flood Insurance Rate Map (FIRM)
- Flood Hazard Boundary Map (FHBM)
- Flood Insurance Study (FIS)
- Aerial and site photos
- Airport base and utility drawings
- Airport Layout Plan
- Airport Master Plan/System Plan
- Geographic Information System (GIS) systems/databases
- Site studies and surveys
- Public resources (USGS)



3.2 Compare Project Effects to Regulatory Conditions

Demonstrating compliance with many storm water quantity and floodplains regulations for new development or re-development projects requires a comparison of pre-development and post-development conditions. Post-development values for parameters such as end-of-pipe peak

flow rates, velocities, and total storm water runoff volumes are often required to be equal to or lower than pre-development values. Alternatively, regulations may require that post-development conditions maintain or improve upon pre-development conditions for multiple parameters and design storm events.

Calculations and models associated with floodplains often require a regional approach, since floodplain impacts can affect areas far beyond the limits of an airport.

3.3 Identify Required Controls and Modifications to Development Project

If planned development would result in an increase in storm water quantity or changes in floodplain boundaries that would exceed regulatory control criteria, it may be necessary to modify post-development storm water discharge characteristics as described below:

- Modify the drainage characteristics or drainage features associated with the development project; or
- Incorporate end-of-pipe structural controls such as detention basins

Development project features that may be affected by storm water quantity and floodplain compliance include:

- The amount, location, and characteristics of impervious surfaces
- Changes in the topography to accommodate drainage pathways or drainage infrastructure
- Low impact features that minimize the volumes of runoff

Storm water and floodplain controls may include structures to route, detain, or otherwise manage the flow rates, velocities, and volumes of discharges. Other controls can minimize fill or disturbances within floodplains, flood-proof utilities or facilities, incorporate sedimentation and erosion controls, or purchase land that is negatively impacted by floodplain changes. The controls could be applied strictly to areas associated with a single airport development, to multiple airport developments, or in some cases, to community-wide developments. Regional controls that address storm water quantity or floodplain needs for multiple projects may be larger in scale and cost, but may simplify compliance efforts when development is widespread. There may also be some cost savings in developing controls that can address long-term development needs and are adaptable for progressive development milestones. A storm water master plan may facilitate the identification of controls that can meet the needs for a variety of development projects.

Storage structures can take the form of small-scale depressed areas, open basins, covered above ground structures, underground structures, and large open basins. Other controls include systems for routing or limiting flows, including infiltration structures, pump stations, conveyance pipes, and valves. Systems for monitoring levels or flow may also be needed.

3.4 Prepare and Submit Compliance Documents

The documents for storm water quantity that need to be submitted to the regulatory authorities to gain approval vary by locale. Regulatory authorities often require submittal and approval of plans and specifications stamped and signed by a professional engineer for new controls and modifications to development project features that affect storm water discharges. The regulatory authorities may also require the submittal of site drainage design drawings, design calculations, and possibly a narrative, to be approved or permitted before site development will be allowed to proceed. Some regulators may require submittal of modeling results and files as well as storm water management plans.

Demonstrating compliance with floodplain requirements involves coordination with the FAA, FEMA, and possibly state or local agencies. State or local regulations may require submittal of plans and specifications stamped and signed by a professional engineer. Many actions impacting floodplains also require environmental documentation according to the NEPA process. NEPA documentation is typically sufficient to satisfy federal documentation requirements.

An airport may wish to apply for an amendment or revision from FEMA to floodplain maps if calculations show that the proposed action and associated controls would change the floodplain area or flood elevations presented on an effective National Flood Insurance Program (NFIP) map. There are three categories of changes to NFIP maps:

- Amendment: Determining if a project is or is not in the floodplain
- Revision: Updating the hydrologic and hydraulic characteristics, or the calculations associated with those characteristics to modify the floodplain elevations
- Revision Based on Fill: Determining if a project involving the placement of fill would exclude certain areas from the floodplain

An airport can also apply for a conditional letter of map change (LOMC) to receive FEMA's comments on a proposed project or a final LOMC once the project has been completed. There are six different types of LOMCs:

- Letter of Map Amendment (LOMA)
- Letter of Map Revision (LOMR)
- Letter of Map Revision Based on Fill (LOMR-F)
- Conditional Letter of Map Amendment (CLOMA)
- Conditional Letter of Map Revision (CLOMR)
- Conditional Letter of Map Revision Based on Fill (CLOMR-F)

For a conditional LOMC or a LOMC, FEMA requires that the application be stamped by a registered engineer.

TIPS FOR . . .

Determining the Measures Needed to Achieve Compliance

- Prepare a Storm Water Master Plan to supplement the overall Airport Master Plan to assess potential area requirements, understand airport-wide storm water management impacts, and develop procedures ensuring that specific project storm water management needs are integrated into the airport's overall storm water management program.
- Identify floodplain boundaries on or adjacent to airport property.
- Acquire information on local flooding issues within the airport's watersheds from municipalities and watershed management groups.
- Identify the capacity of downstream infrastructure and receiving streams to gage potential cumulative effects of storm water discharges from various outfalls.
- Create a baseline map of flooding of on airport surfaces and flood zones under various storm conditions.
- Identify sources of storm water discharges onto the airport from non-airport properties.

- Consider that failure to use required methods and models can result in project delays and additional project costs. The choice of calculation methods and models will also depend upon parameters needed to facilitate the project design, project complexity, schedule, cost, and the degree of accuracy required.
- Contact floodplain management agencies to ensure project compliance with design standards or mitigation to floodplain impacts are sufficient. Coordinate with FAA, FEMA, state, and local agencies to confirm potential violations of floodplain management policies and for the selection and design of required controls and possible project modifications. Keep the agencies aware of potential design changes.
- Evaluate if features required to address one project's storm water needs affect storm water management in other areas of the airport.
- Recognize that measures taken to meet storm water quantity regulatory requirements may affect compliance with other requirements such as water quality–based limitations.
- Consider reducing the extent and cost of end-of-pipe controls through use of local controls or through implementation of low impact and sustainable design features such as pervious pavement and green roofs.
- Assess the effects of localized space constraints, wildlife hazard attractant concerns, and the potential for interference with project function or operations when considering sites for storm water quantity controls. Local controls can be most effectively added if their design is incorporated into the development project design.
- Be aware that end-of-pipe controls have less potential for interference with project function or design, but often require a significant footprint because they frequently need to manage water from multiple drainage areas.
- Apply for a LOMC to help ensure the proposed project will meet necessary floodplain requirements according to FEMA Reducing the Potential Impacts on Development Projects.

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this fact sheet identifies the ways in which the planning and management of storm water quantity and floodplain issues can affect development project and project planning.

4.1 Siting and Construction of Development Project

Planning considerations for reducing the effect of storm water quantity and floodplain compliance on the development project features and control infrastructure is provided below.

- One often overlooked aspect of compliance with storm water quantity regulations is space requirements. The need for large areas for storm water detention is common, but is frequently considered after the development sites have been selected. Considering the frequent limitations in available space and hazardous wildlife concerns, the designation of potential storm water storage and management areas in the airport master plan could help minimize impacts to individual development projects.

- Other planned airport development projects and existing airport facilities may also be impacted by storm water management for new development through the incorporation of new drainage infrastructure. New drainage infrastructure and flow routing has the potential to impact downstream drainage infrastructure. Airports should consider the value of seeking out the expertise to consider airport-wide storm water management issues, implications, and opportunities when planning new projects.
- There may be a need to plan for upgrades to existing downstream infrastructure to accommodate discharges from planned development that are not subject to flow controls. Any bottlenecks that are created in the drainage system can also impact other airport drainage areas that are tributary to the same system, through surcharging and limitations in flow capacity.
- In some cases, only portions of a project may need revision of project function or scope to avoid or minimize floodplain impacts. Flexibility of development project design will allow for more opportunities to adapt to regulatory constraints as they arise.
- When assessing sites in the early project planning phases, the presence of floodplains, especially for large storms (e.g., 100-year), should be a significant factor in the decision-making matrix.
- Relocation of the entire project or revision to the layout to avoid floodplain impacts may be necessary in some cases if significant public or regulatory resistance is encountered. Measures, such as fill to raise the development project out of the floodplain, should be considered. Additionally, having alternate sites for the development project, if feasible, may reduce delays if a change is made.
- If multiple projects are foreseen that may impact floodplains, flood proofing facilities or land acquisition should be considered to minimize economic losses or land negatively impacted by the project characteristics.

4.2 Airport Operations

Planning consideration for reducing the effect of storm water quantity and floodplain impacts on airport operations are provided below.

- Devote land to storm water management for future development projects to reduce construction-related impacts to operations.
- Design projects to minimize number and area of open storage structures to reduce wildlife management issues.
- In cost analyses, include the need for ongoing maintenance of storm water controls required to mitigate or minimize floodplain impacts, such as pump stations or detention basins.

4.3 Schedule and Sequencing

The process for assessing, demonstrating, and implementing compliance measures for storm water quantity and floodplains can be lengthy and integrally related to the planning, permitting, design, and construction of the development project itself. Items that typically have the most significant impact on schedule are shown in the table below.

The sequencing of these activities in relation to the development project is critical. Failure to adequately identify and collect the data needed for modeling and design can be a significant setback in the ability to stay on schedule. Failure to integrate the permitting, design, and construction schedules for the controls with the permitting, design, and construction schedule for the development project can have cascading impacts on schedule as well.

In most cases, the process for acquiring permits and approvals will overlap to some degree with the implementation of compliance measures and the overall development project imple-

mentation process. It is important to acquire project-specific schedule information from regulators, environmental compliance staff and consultants, design engineers and construction personnel to prepare an overall schedule that effectively integrates and sequences the project steps.

For complex projects, the process for implementing storm water quantity and floodplain compliance measures can be a multi-year process.

Aspects of complying with storm water quality and floodplains regulations that affect schedule include:

- Review of FEMA FIRMs
- Site surveying
- Characterizing floodplain impacts (calculations and modeling)
- Community outreach and public review
- Refining floodplain controls
- Selecting mitigation measures
- Designing of controls and mitigation measures
- Constructing controls
- Purchasing land (if necessary)
- NEPA process (if applicable)

Properly sequencing these activities is a key planning activity.

4.4 Project Costs

For most storm water quantity management systems, the capital cost considerations are more significant on an average annual basis than the operations and maintenance cost considerations.

Floodplain impacts have the potential to affect large areas well beyond the boundaries of an airport; therefore, controls may need to be far reaching. For example, if a proposed development project will cause an increase to flood elevations, extensive mitigation efforts may be required to minimize the negative impact to public safety and reduce the change of significant economic losses both on and off airport property. Airports may decide to purchase properties that may be affected by floodplain impacts associated with airport development. Project costs associated with floodplain mitigation or property acquisition should be considered early during project development.

In many cases, there is a direct relationship between the capital cost of an airport development project and the capital costs of measures to achieve compliance with storm water quantity and floodplain requirements. This is especially true when large acreages of undeveloped pervious areas are converted to impervious surfaces like runways, taxiways, parking lots, buildings, and roads to meet project needs and aviation safety design standards. Additional costs associated with identifying storm water quantity and floodplain impacts include:

- Site surveying
- Modeling
- Maintenance of controls
- Community outreach
- Property acquisition
- Facility flood proofing

It may be advisable to assess the storm water quantity and floodplain management costs as part of the overall development project costs because of the direct connections of the respective infrastructure.

GUIDANCE FOR . . .
Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Water Resources Inventory	Create an inventory for storm water data that includes maps of airport areas with flooding issues and capacity limitations. Understand the source of the floodplain boundaries obtained from federal agencies and include mapping of floodplain boundaries in inventory. The boundaries in FIRM documents may not be accurate on smaller project scales.
Modeling, Calculations, and Analyses	Coordinate with regulators to determine approved modeling programs, calculation protocols, and level of detail that may be acceptable. Identify appropriate level of detail to collect in support of modeling and analyses and provide a reasonable estimate of storm water discharges (e.g., select a minimum pipe size or drainage basin size to be modeled).
Conceptual Planning	Consider development of a storm water master plan or integrating storm water master planning into airport master planning. Master plans may be useful for considering the storm water needs for long-term or phased development, in addition to widespread development.
Control Siting	Consider potential floodplain impacts associated with long-term development as part of storm water master planning process. Identify and characterize potential sites for controls in the Conceptual Planning Phase. Avoid impacts inside the floodplain, where possible. Perform a detailed assessment of controls in the Detailed Planning Phase.
Design Implementation	Build infiltration and temporary storage into development project design where possible, to reduce extent of necessary end-of-pipe controls. Avoid project by project designs of controls that do not consider affects to overall airport storm water drainage. Understand detailed regulatory requirements for design submittals. Consider the need for modifications to controls to minimize attraction of hazardous wildlife. Identify storm water controls that may help to reduce floodplain impacts and coordinate with development project construction.
Construction of Controls	Coordinate design and construction of controls with design and construction of the development project to avoid development project delays from unfinished controls.

Item	Factors that Can Reduce Cost and Shorten Schedule
Scheduling and Sequencing	Well planned and coordinated schedules for development project and storm water quantity assessments can reduce management and consultant costs.
Staffing	Utilize experts familiar with storm water modeling on an airport-wide and watershed-wide basis.
Stakeholder Coordination	Coordinate with local agencies, nearby property owners, regulators to assist with identifying core regulatory requirements, interests, and data on local flooding issues. Coordination early in Detailed Planning Phase can help avoid multiple iterations of design.
Mitigation	Purchase property or provide flood proofing for facilities to minimize potential flooding impacts.
Documentation	Identify if map revisions are needed and prepare documentation early in the project implementation process.

Fact Sheet 4
Hazardous Wildlife Attractants

The water resource issue category "Hazardous Wildlife Attractants" encompasses the impacts of airport development projects on water resources that attract wildlife, and associated public safety and aircraft operational issues. The focus of the hazardous wildlife attractants issue is on the potential creation of new water-based hazardous wildlife attractants associated with new or re-development at an airport. This fact sheet presents guidance on planning for and managing the issues.

1.0 Description of Water Resource Issue and Impacts

As considered in the Handbook and in this fact sheet, the hazardous wildlife attractant water resource issue is related to the effects that development projects can have on water resources that, in turn, impact airport operations and safety.

Wildlife strikes are typically responsible for at least $500 million in damage and 500,000 hours of aircraft downtime each year, as of 2005 (*6*). The Federal Aviation Administration (FAA) reports that wildlife strikes have been associated with billions of dollars in total damages, and more critically, hundreds of passenger deaths worldwide over the last century (*7*). Water-based impacts associated with hazardous wildlife issues include:

- Wildlife strikes and near-strikes
- Aircraft damage
- Injuries and fatalities
- Aircraft downtime
- Operations required to frequently monitor/minimize hazards

While aircraft safety is paramount, the need to manage wildlife hazards can complicate water resource management associated with new development projects. The degree of management of wildlife hazards is site specific, depending upon the type and extent of birds, time of year, climate, proximity to off-airport attractants, and bird migratory patterns, among other factors. For example, an airport that is located along traditional bird migration routes may have a significantly different approach than an airport that has local birds seeking nesting areas. Potential hazards that may attract wildlife include both natural and constructed facilities that provide a habitat, food or water source, or otherwise have the potential to attract wildlife to the Air Operations Area (AOA), where a wildlife strike has the potential to occur. In some cases there may be hazardous wildlife attractants associated with existing facilities or natural features in the vicinity of an airport. Water-based wildlife hazard attractants include wetlands, detention basins, poorly draining areas, standing water, landfills, and wetland-based vegetation.

Information on related water resource issues can be found in other fact sheets, as indicated here.

RELATED FACT SHEETS

Water Resource Issue Fact Sheet	Relationship
Storm Water Quantity and Floodplains	Storm water management facilities, such as detention basins, may be classified as hazardous wildlife attractants. Modifications to floodplains may create a new hazardous wildlife attractant or exacerbate an existing hazardous wildlife attractant issue. Special design criteria and wildlife deterrents must be incorporated into the design and operation of such facilities, per FAA advisory circulars.
Surface Water and Groundwater Quality	Water quality treatment facilities and BMPs may promote standing water or vegetation with the potential to attract hazardous wildlife. Design criteria geared toward promoting water quality may conflict with hazardous wildlife attractant management principles.
Physical Impacts to Wetlands and Other Surface Waters	Physical impacts may be unavoidable if necessary to eliminate significant wildlife hazard attractants within the AOA. Mitigation for physical impacts may need to be strategically located outside of minimum separation criteria established by the FAA, which may limit the ability to provide mitigation in close proximity to the impacts.
Coastal Zones and Barriers	Certain resources within coastal zones may act as habitat or attractants for hazardous wildlife. It may be necessary to enact deterrents and management techniques that minimize the risk for wildlife strikes while protecting coastal resources to the extent possible.
Aquatic Life and Habitat	The goal of preserving habitat for aquatic species may conflict with the need to eliminate or minimize potential habitat for hazardous wildlife. Elimination of or mitigation for potential hazardous wildlife attractants could also result in impacts to threatened and endangered species.

2.0 Identification of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the potential effects of hazardous wildlife attractants and airport development projects to protect aircraft and passenger safety. Section 2 of this fact sheet provides the following:

- A summary of the hazardous wildlife attractant regulations associated with water-based developments typically applicable to airports
- A methodology for identifying the core regulatory requirements generally applicable to each airport locale

2.1 Summary of Core Regulatory Requirements

The rate of occurrence of reported wildlife strikes has been found to be increasing, and the recent public attention drawn to the issue by the "Miracle on the Hudson" incident has led to increasing scrutiny and initiatives by FAA.

Requirements for managing wildlife hazards at airports are aimed at minimizing the attraction of hazardous wildlife to AOAs, and thus minimizing the risk for collisions between aircraft and wildlife.

Federal Aviation Regulation (FAR) 14 CFR Part 139.337 contains specific requirements for performing Wildlife Hazard Assessments (WHAs) as well as developing Wildlife Hazard Management Plans (WHMPs) to investigate and address, respectively, observed wildlife hazards at airports. As part of the National Environmental Policy Act (NEPA) process, FAA has the ability to require the performance of a WHA or, if determined necessary by FAA, the development of a new WHMP or update to an existing WHMP, as part of a conditional approval. WHAs and WHMPs are required to be submitted to the FAA for review and approval, and incorporated into the Airport Certification Manual (ACM), which documents the airport's compliance with FAR Part 139. While Part 139.337 specifically requires WHAs in response to a triggering wildlife event, FAA initiated a rulemaking in 2009 (planned to be published in 2010) to make WHAs mandatory for all Part 139 airports regardless of whether a triggering event has occurred (*8*). Previously in some cases, wildlife attractiveness issues were not called into attention until a bird strike or collision occurred, resulting in the source of the accident to be investigated and mitigated.

The FAA's requirements for wildlife hazard management for existing and proposed facilities are largely encompassed in FAA Advisory Circular (AC) 150/5200-33B: "Hazardous Wildlife Attractants on or Near Airports," although there are FAA requirements related to hazardous wildlife attractants in other advisory circulars as well (*9–11*).

Hazardous wildlife attractant management criteria provided in AC 150/5200-33B with the potential to affect airport development projects include the following:

- General separation criteria for hazardous wildlife attractants on or near airports
- Discouraged land-use practices on or near airports that potentially attract hazardous wildlife
- Management techniques, design criteria, and deterrents for hazards that must be located within separation criteria
- Procedures for wildlife hazard management by operators of public-use airports, including performance of WHAs and WHMPs in accordance with FAR 14 CFR Part 139.337.
- FAA notification and review of proposed land-use practice changes in the vicinity of public-use airports

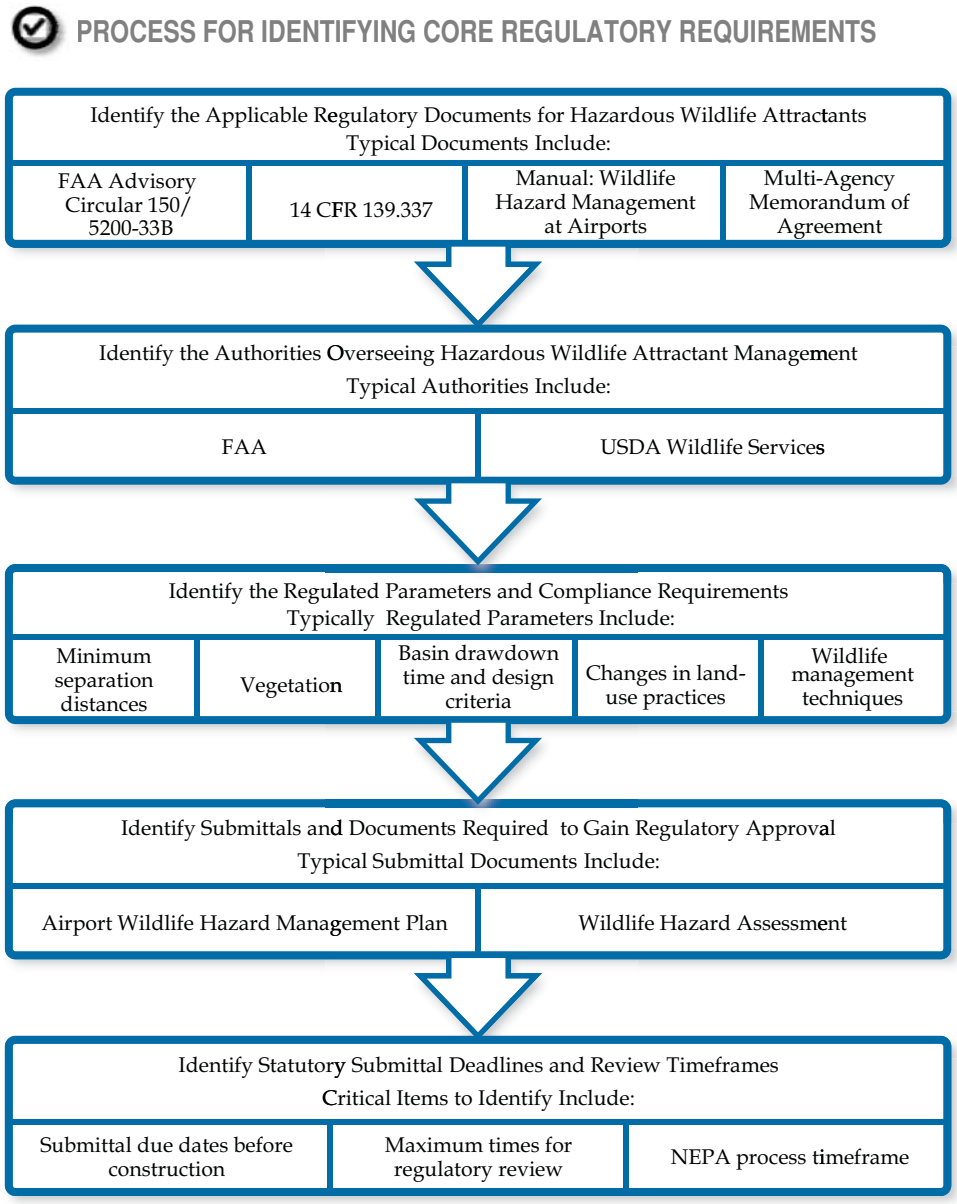
The FAA's goal for minimizing water-based hazardous wildlife attractants can sometimes conflict with the goals of other regulatory agencies to improve water quality and quantity control through onsite detention and treatment. For example, a requirement for a detention basin to have a permanent wet pool or minimum drawdown time has the potential to conflict with the FAA's requirement for basins to drain within 48 hours and remain dry between rain events. When conflicts exist between regulatory requirements, airports should seek regulatory waivers or variances for requirements that may pose a safety risk.

The FAA established a Memorandum of Agreement (MOA) with the United States Fish and Wildlife Service (USFWS), the United States Army, the USEPA, the United States Air Force (USAF), and the United States Department of Agriculture (USDA) in an effort to address these conflicts. The goal of the MOA is to acknowledge each agency's mission as well as the potential for certain environmental and site conditions to contribute to the potential for wildlife strikes. The MOA establishes procedures for the agencies to coordinate their missions with a goal of more effectively addressing potential hazardous wildlife attractants while protecting environmental resources.

The FAA also established a separate Memorandum of Understanding (MOU) with the USDA Wildlife Services to establish the role of each agency in mitigating wildlife hazards. The USDA assists the FAA with performing WHAs, contributing to and reviewing airports' WHMPs, and also serving as a guidance resource for airports in the identification and mitigation of potential hazardous wildlife attractants. The agencies have jointly developed a manual to assist airports in these tasks, *Wildlife Hazard Management at Airports: A Manual for Airport Personnel* ("Wildlife Hazard Manual").

An airport operator also needs to be aware of the regulations protecting birds. Migratory birds are protected under the Migratory Bird Treaty Act of 1918 (16 USC 703-711). Non-migratory species are protected under state laws. Certain species may also be protected by the Endangered Species Act of 1973.

As discussed in Section 2 of the Handbook, it is recommended that airport representatives identify and document the core regulatory requirements associated with each water resource issue before planning begins. The figure below identifies a methodology for identifying those core requirements. The figure also includes references to commonly found results from that analysis.



TIPS FOR . . .
Identifying Core Regulatory Requirements

- Refer to FAA ACs and guidance for specific definitions of hazards, discouraged land uses, and other compliance criteria.
- Refer to FAA, USDA, airport safety, and airport operations and maintenance resources to help identify potential hazards and potentially acceptable mitigation approaches and management techniques.
- Seek guidance on overlapping and conflicting requirements for managing hazardous wildlife attractants and other water resource management issues. Assess whether multiple entities have jurisdiction.

3.0 Determination of the Measures Needed for Compliance

Section 3 of this fact sheet presents a methodology for determining the means of achieving compliance that is specific to each project.

3.1 Characterize Project Effects

Characterizing effects of a development project on hazardous wildlife attractants requires collection of information to identify development project design features or characteristics. Information is also required on existing site features or land uses in the vicinity of the project. Specific examples of development characteristics that can act as hazardous wildlife attractants include:

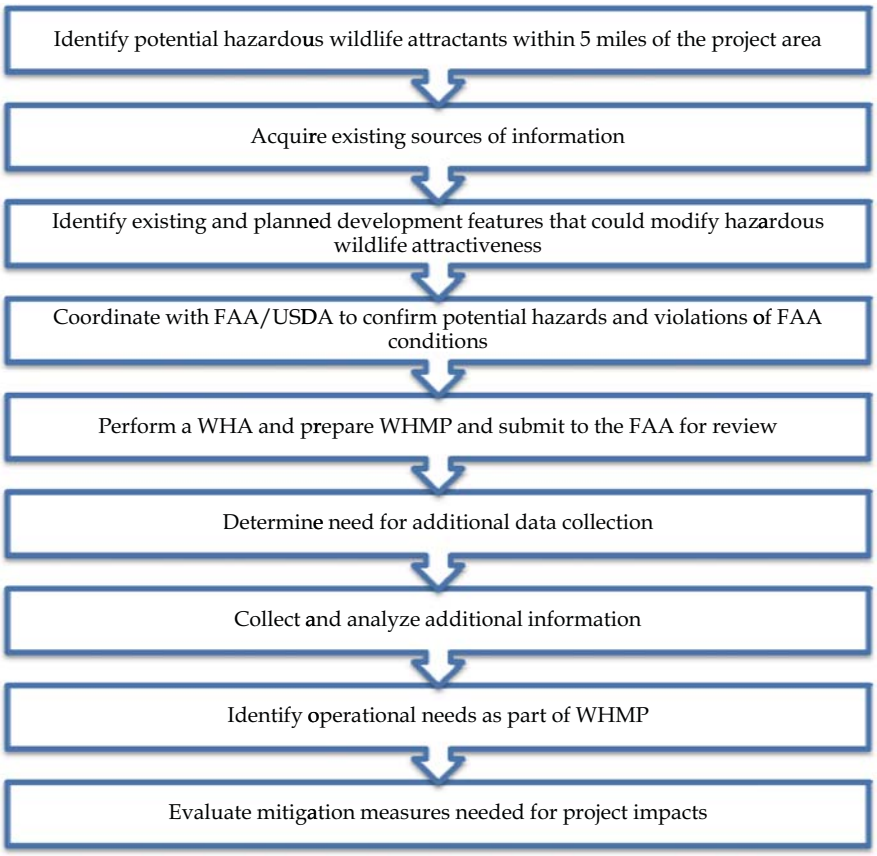
- Standing water, providing habitat and water source for waterfowl and other wildlife;
- Vegetation, providing food and shelter for wildlife; and
- Structures providing shelter and roosting habitat.

Consider also that some land uses, including new and existing features, may act synergistically to create a hazardous wildlife attractant. For example an agricultural site that provides a food source may act synergistically with an open water surface to create a migration pathway for migratory birds.

Information to help characterize project effects may be obtained from the sources identified below.

- Aerial and site photos
- Airport base and utility drawings
- Airport Layout Plan
- Airport Master Plan/System Plan
- GIS systems/databases
- Site studies and surveys
- Public resources (USGS)
- Consultation with regulators

Recommended Steps for Characterizing Project Effects on Hazardous Wildlife Attractants



3.2 Compare Project Effects to Regulatory Conditions

With respect to hazardous wildlife attractants, the goal of the aviation industry is to create no new hazardous wildlife attractants and reduce their level if possible. However, development projects, and the need to manage other water resource issues for other development projects, often create new hazardous wildlife attractants. This produces a conflict between minimizing the attractants and complying with other water resource requirements.

USDA Wildlife Services and FAA should be consulted to review potential wildlife hazards (related to FAA hazardous wildlife guidelines and design criteria) and determine whether the project and surrounding site features are in compliance. The review should include AOA separation distances and locations, occurrence and duration of standing water, vegetation and landscaping, grading, potential sources of food, and generally discouraged land uses near the AOA. Additionally, a WHA, if recommended by the FAA or USDA, can help identify regulatory conditions that conflict with hazardous wildlife.

3.3 Identify Required Controls and Modifications to Development Project

Minimization of risk for wildlife strikes may prohibit the construction of new facilities, unless the attraction of wildlife can be appropriately managed through the use of controls and deterrents. Additionally, requirements to manage hazardous wildlife attractants could secondarily

impact the design of water management facilities that are needed to address other water resource issues (e.g., water quality, water quantity, and physical impacts to surface waters) at an airport.

Compliance with requirements for managing hazardous wildlife attractants may require that project-related water features be redesigned, relocated, or modified to incorporate wildlife deterrents. Modifications could include relocation to address separation distances, elimination of an existing hazard in the vicinity of the project, changes to design characteristics to make the project less attractive to wildlife, or the incorporation of deterrents or management techniques. Modifications such as these have the potential to significantly impact the project schedule, cost, staffing resources, and ability to obtain regulatory approval, if not appropriately anticipated.

3.4 Prepare and Submit Compliance Documents

Required controls and modifications will need to be incorporated into the project design and considered in the NEPA process. Regular coordination with FAA and USDA is typically required throughout the project design and NEPA process to keep the agencies abreast of any project changes and to allow communication of additional concerns or recommendations. FAA should be involved in the regulatory demonstration and approval process with other regulatory entities.

TIPS FOR . . .

Determining the Measures Needed to Achieve Compliance

- Include existing and potential future hazardous wildlife attractants as part of an airport-wide Water Resource Inventory, and create a map of those within five miles of the airport's AOA.
- Consider potential hazardous wildlife hazards that are created as a result of needing to comply with other water resource issues on development projects (e.g., detention basin to meet storm water quantity criteria).
- Consider potential synergistic effects in the attraction of hazardous wildlife of existing airport and off-airport land uses within a five-mile radius.
- Make use of local USDA Wildlife Services contacts, airport operations and safety experts, and industry guidance manuals for consultation and technical advice.
- Coordinate early and often with FAA and USDA during planning, design, and NEPA or other regulatory processes. Keep them aware of project design and inform them about any potential design changes (including mitigation measures required for compliance with other water resource issues) that may have an effect on hazardous wildlife attractants.
- Consider performing a WHA to identify existing or potential hazards during the conceptual planning phase based on planned long-term development. The analysis should include evaluation of features that may be required to address other water resource–related regulations, such as storm water management facilities and controls and mitigation for physical impacts to surface water.
- Consider new airport facilities or expansion of existing airport facilities that may extend the AOA and effectively create new wildlife hazards out of existing water resources or land uses that fall within the expanded AOA. Take into account any planned changes to the AOA.

- Coordinate with FAA, USDA, airport operations, and airport safety personnel for the selection and design of required deterrents, controls management techniques, and possible project modifications.
- There are a variety of guidance manuals available that describe potential techniques for wildlife hazard management (*6*).

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this fact sheet identifies the ways in which hazardous wildlife attractants planning and management can affect development project and project planning.

4.1 Siting and Construction of Development Project

Planning considerations for reducing the effect of compliance with hazardous wildlife attractants requirements on the development project features and mitigation measures are provided below.

- Relocation of project features or revision to the layout to meet separation criteria may be necessary in some cases to address potential aircraft safety issues. Airport representatives should consider alternate siting options for project features with the potential to attract wildlife to reduce the potential for delays.
- When assessing sites in early project implementation phases, the presence of existing hazardous wildlife attractants should be a significant factor in the decision-making matrix.

4.2 Airport Operations

Achieving compliance with hazardous wildlife attractant issues may impact post-construction airport operations. Potential operational impacts associated with the integration of the development project planning with hazardous wildlife attractant compliance planning are provided below.

- The need to move or modify a development project can result in the desired operational levels not being reached.
- The need for monitoring and maintenance of structural wildlife deterrents at development sites following construction can be a significant cost component and should be a consideration in assessing total project costs. Maintenance may include frequent mowing of vegetation, basin liners, bird wire, or fencing.
- Operational management for non-structural management techniques, such as the operation of detection and tracking systems, monitoring and reporting programs, firearms and other deterrents, and other passive and active wildlife controls may require additional staffing roles and responsibilities for airport personnel.

4.3 Schedule and Sequencing

The primary schedule components associated with the management of hazardous wildlife attractants include the process for assessing and characterizing potential hazards (including WHA if required), regulatory coordination to confirm potential hazards and select mitigation measures, NEPA process (if applicable), and WHMP development (if required).

As hazardous wildlife attractants management is often associated with secondary project features that are necessary to comply with other regulatory requirements, it is not uncommon for

potential wildlife hazards to be identified late in the project design. If FAA and USDA are not kept informed of project changes and potential hazards, the process to address these hazards and get approval for their mitigation late in the project can cause significant delays in the NEPA approval process.

4.4 Project Costs

Similar to scheduling impacts, cost impacts may also be incurred when hazardous wildlife attractants are not identified and addressed until late in the project design process. The project modifications necessary to mitigate for potentially unforeseen hazards and minimize the risk of wildlife strikes may involve significant costs, such as changes in location or approaches for storm water management. It may be necessary to customize the controls to fit an existing project design, if possible, or to modify the design to fit with potential controls.

The incorporation of structural controls into a project design, such as bird wire, basin liner, or fencing, can be a very significant capital cost, and in some cases lead to significant maintenance costs. Other approaches may be available to minimize these hazards. In general, if it is possible to make minor modifications to a project to minimize wildlife attraction while still meeting the intent of the project, it may be more cost effective to do this than to implement structural deterrents. This is especially true if the hazards and modifications can be identified during planning phases, when the costs and effort associated with modifying the project will be less significant. The simplest approach, where feasible, is to select a project location that is outside of the recommended minimum separation criteria. This approach may be feasible for hazards associated with wetland mitigation projects, if acceptable to perform mitigation at an off-site mitigation bank, but is typically not feasible for storm water management facilities, unless airports are able to partner with downstream, off-site facilities as part of a regional storm water management approach. Another option for storm water management facilities may be to design a detention basin that meets the design criteria specified within AC 150/5200-33B, including drawdown time, sideslopes, vegetation, and avoidance of permanent pools between storm events, provided that these criteria can be negotiated with storm water quantity regulatory authorities. This approach may require separate Best Management Practices (BMPs) to address water quality control.

Elimination of the water surface can be achieved for storm water detention facilities through the use of underground piping or underground storage structures, although these structural controls may be more costly than an open basin approach.

GUIDANCE FOR . . .
Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Identification of Hazardous Wildlife Attractants	Determine the potential for hazardous wildlife attractants associated with the project and surrounding areas early in the Detailed Planning Phase
Data Collection	Perform a WHA and develop a WHMP early in the Detailed Planning Phase and submit to FAA and USDA for review

Item	Factors that Can Reduce Cost and Shorten Schedule
Design Development	Consider combinations of project modifications, operational techniques, and deterrents and controls that are the most cost effective. Carefully consider the documented effectiveness of wildlife hazard attractant control methods, which can be quite costly.
Control Siting	Locate projects in areas where there are no issues associated with hazardous wildlife attractants
Mitigation	Identify potential hazards and mitigation approaches in the Conceptual Planning Phase, and incorporate management techniques and wildlife deterrents into design features to the extent possible
Staffing	Involve airport and airline experts in wildlife hazard management and aircraft safety, and local Wildlife Service representatives, in Conceptual Planning and Detailed Planning Phase discussions
Stakeholder Coordination	Communicate wildlife hazard attractant concerns to other entities that may be considering storm water or flooding controls in vicinity of airport. To the extent possible, facilitate coordination between agencies regulating storm water quantity and agencies regulating wildlife hazard attractants in the Conceptual Planning and Detailed Planning Phases.

Fact Sheet 5
Aquatic Life and Habitat

The water resource issue category "Aquatic Life and Habitat" encompasses the impacts of airport development projects on aquatic organisms and their habitats. For the purposes of this fact sheet, aquatic life and habitat include plants, animals, fish, microorganisms, etc. associated with or dependent on water resources on the airport or in the immediate surrounding area. The category includes federal (i.e., threatened and endangered species) and state-protected species and habitat. This fact sheet presents guidance on planning for and managing the issues associated with the impacts to aquatic life and habitat, and the associated documentation, consultation, and mitigation requirements for airport development projects.

1.0 Description of Water Resource Issue and Impacts

For over a century, there has been a public concern over the extinction of animal species and loss of critical habitat. As a result, threatened species (and associated habitat) are protected by federal law, state and local regulations. Water resources on airport property, such as wetlands, streams, or temporarily ponded areas, and adjacent areas may provide habitat for aquatic life.

As a result of the considerable regulatory protection provided to these species, airports may encounter significant challenges during development projects that potentially impact aquatic life and habitat. Airport development projects could threaten aquatic life and habitats in a variety of ways, including construction activities that may directly impact aquatic life, habitat, and ecosystems. Airport development projects also frequently involve acquisition of new property which may contain protected biotic resources. Species and habitats can also be affected through secondary effects associated with ongoing operations, such as changes in discharges of storm water or treated wastewater. In some cases, secondary effects may occur off airport property and downstream of the actual development project. Airport development activities may proceed, with regulatory approval, provided that the actions do not jeopardize the protected species or its habitat.

Information on related water resource issues can be found in other fact sheets, as indicated below.

RELATED FACT SHEETS

Water Resource Issue Fact Sheet	Relationship
Surface Water and Groundwater Quality	Water quality regulations provide protection for the designated uses of surface waters. Surface waters may provide critical habitat or contain threatened and endangered species. Storm water discharges must comply with both sets of regulatory requirements.
Storm Water Quantity and Floodplains	Floodplain areas may contain critical habitat for aquatic species. Changes in storm water quantities from development areas during and after construction can also potentially affect habitats through scouring, effects on floodplains, and flooding.
Physical Impacts to Wetlands and Other Surface Waters	Streams or wetlands may contain aquatic species or critical habitat for these species. When a stream or wetland permit application is submitted, information pertaining to regulated species must be included in the application.
Wild and Scenic Rivers	Wild and Scenic Rivers contain aquatic species, and may include areas of critical habitat.
Coastal Zones and Barriers	Coastal zones and barriers are typically populated with many different types of aquatic species and critical habitat.
Hazardous Wildlife Attractants	Aquatic areas (ponds, wetlands, streams) containing regulated species at an airport may pose a safety hazard if the Federal Aviation Administration (FAA) requirements for water resources and hazardous wildlife attractants are not met.

2.0 Identifcation of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the potential effects of development projects on aquatic life and habitat. Section 2 of this fact sheet provides the following:

- A summary of principal aquatic life and habitat regulations typically applicable to airports
- A methodology for identifying the core regulatory requirements generally applicable to each airport locale

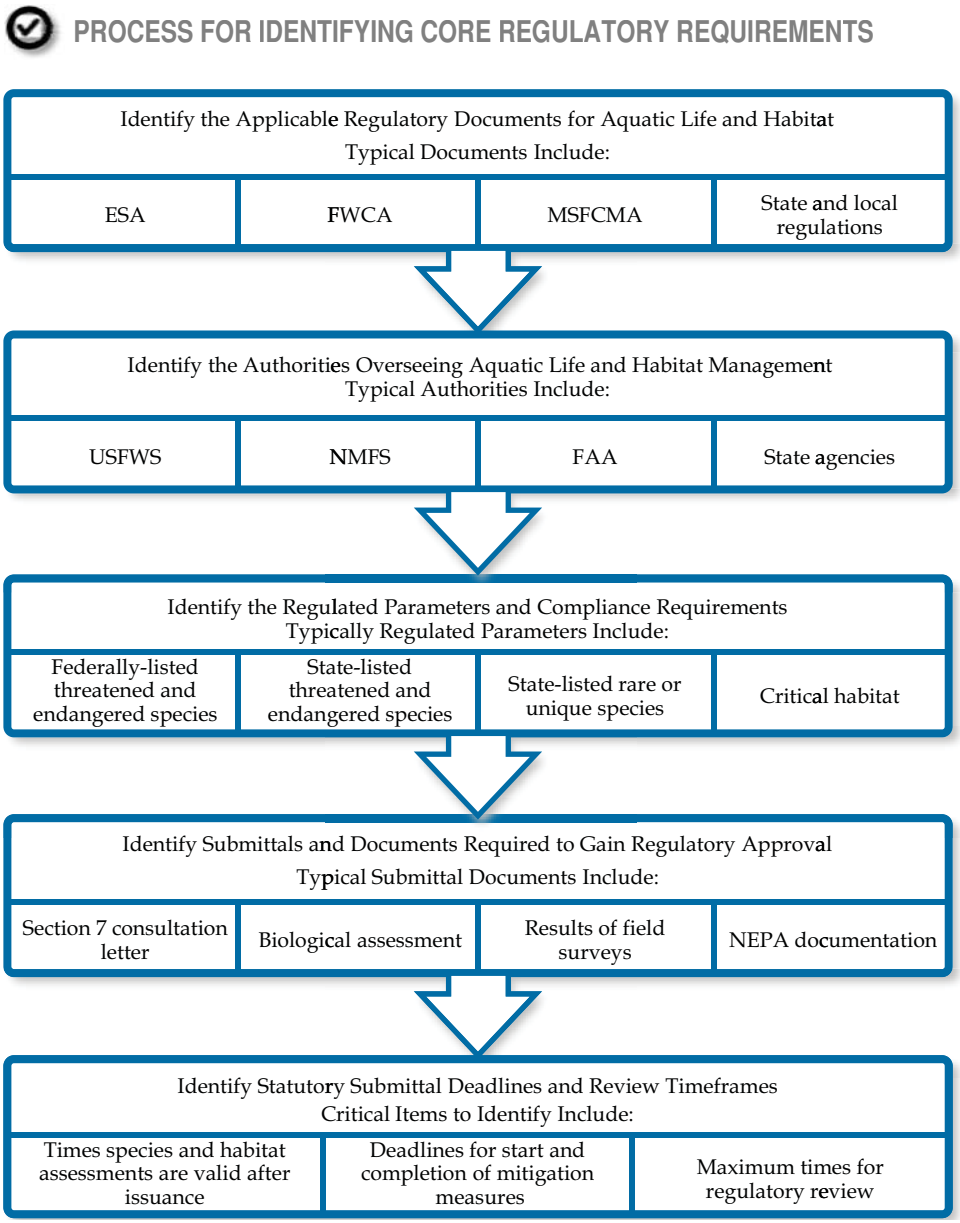
2.1 Summary of Core Regulatory Requirements

The regulatory requirements for protection of aquatic species and habitat may focus on specific species or they may be more broadly associated with particular types of species or habitats (e.g., marine, freshwater). Regulatory protection of aquatic species and their habitats occurs on both the federal and state level. While most of the regulations are federal, protected species are listed under both federal and individual states' regulatory requirements. The principal federal regulations governing aquatic species and their habitats are associated with the Endangered Species Act of 1973 (ESA).

The ESA was developed by recognizing that many of the country's native plants and animals were becoming extinct. The purpose of the ESA is to protect and recover imperiled species considered threatened or endangered and the ecosystems upon which they depend. Threatened and endangered species are protected under the ESA because of their "aesthetic, ecological, educational and scientific value to our Nation and its people." Section 7 of the ESA requires federal agencies to conduct consultations to ensure that federal actions that are authorized, funded, or carried out are not likely to jeopardize listed species or result in destruction or adverse modification of designated critical habitat.

The United States Fish and Wildlife Service (USFWS) has primary responsibility for protecting terrestrial and freshwater organisms, while the National Marine Fisheries Service (NMFS) is primarily responsible for marine wildlife (e.g., whales and migrating fish, such as salmon).

Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threat-



ened" means a species is likely to become endangered within the foreseeable future. "Candidate Species" are species that are identified to be potentially listed as threatened or endangered, but are not currently regulated under the ESA. All species of plants and animals, except pest insects, are eligible for listing. Additionally, "Critical Habitat" includes areas in the environment (such as trees, riparian areas, or streams) that are specifically needed for the species habitat or survival. Other legislative acts followed the ESA, including specific regulation of aquatic life and habitat.

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA) is the primary law governing marine fisheries management in United States federal waters. The MSFCMA relates to ocean species and contains requirements to avoid areas of Essential Fish Habitat (EFH), which are waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. If a federal action would affect EFH, an impact assessment on the affected EFH is required. Compliance with the MSFCMA is administered by NMFS.

As with Section 7 of the ESA, the Fish and Wildlife Coordination Act (FWCA) requires federal agencies involved with water resource projects, including construction, licensing, or permitting, to first consult with the USFWS and state agencies regarding the impacts on fish and wildlife resources. This allows these agencies the opportunity to review projects that have the potential to impact these species or habitat. Additionally, federal agencies must take action to prevent loss or damage to wildlife resources, and provide for the measures taken to mitigate such impacts. Mitigation must be conducted in consultation with the regulating agency.

As discussed in Section 2 of the Handbook, it is recommended that airport representatives identify and document the core regulatory requirements associated with each water resource issue before planning begins. The figure below identifies a methodology for identifying those core requirements. The figure also includes references to commonly found results from that analysis.

TIPS FOR . . .
Identifying Core Regulatory Requirements

- Recognize that any federal action which could jeopardize a listed species or modify its critical habitat is prohibited.
- If impacts cannot be avoided, identify mitigation options that may be acceptable to regulators based on regulatory guidance documents.
- When identifying protected species and species of concern, identify both state and federal regulatory conditions. Seek to understand the distinctions among the listing categories and the differences between presence on federal and state lists. Review federal the listings and mapping to determine if any protected species are present in the project area.
- Distinguish among the roles of the various agencies involved in the process and facilitate their coordination when necessary.
- Consider that potential impacts to habitat can lead to compliance challenges even if the presence of threatened and endangered species has not been specifically determined.
- Determine the regulations that are applicable to your specific situation. In some cases biotic resources not protected by the ESA may be regulated elsewhere.
- Review the Endangered Species Bulletin to learn about rulemakings, recovery plans and activities, regulatory changes, interagency consultations, changes in species' status, research developments, and new ecological threats.

3.0 Determination of the Measures Needed for Compliance

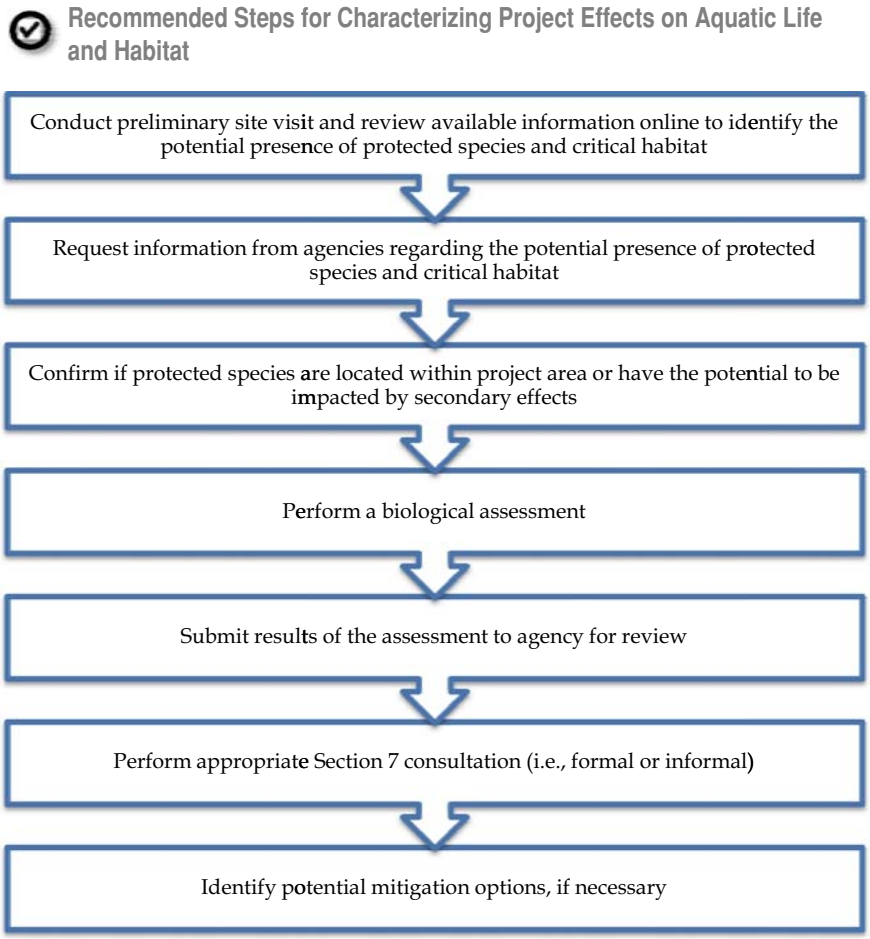
Section 3 of this fact sheet presents a methodology for determining the means of achieving compliance that is specific to each project.

3.1 Characterize Project Effects

Airport development projects may require the physical removal of aquatic species or habitat. To satisfy the ESA, as part of the National Environmental Policy Act (NEPA) process, a review must be conducted to determine if a proposed action would affect a federally listed species or critical habitat. Characterization of species or habitat in the project area can be started by reviewing online information available on regional USFWS or NMFS websites. Letters can also be sent to each agency, requesting information about the area. Site surveys may also be conducted to determine the presence of species or potential habitat. The protected species and critical habitats may vary.

If protected species or a critical habitat is identified as potentially being present within the project area, a biological assessment or other field assessments must be conducted to identify probable locations of protected species, its habitat, and any required mitigation needed. In some cases, information on candidate species should be included in the biological assessment.

Species and habitats can also be affected through secondary effects associated with ongoing operations, such as changes in water quality. In some cases, secondary effects may occur off airport property and downstream of the actual development project. Assessing project-specific



aquatic life and habitat quality compliance requirements requires an understanding of the characteristics of discharges to surface waters. This characterization can be complex because multiple species and habitats may be involved. In addition, the same development project may have differing effects and regulatory issues associated with different species and habitats.

While many potential effects to aquatic life and habitat can occur as a result of construction, long-term effects on degradation of habitat also need to be considered. Project impacts such as changes to flow rates, erosion of stream beds and banks, pollutant loadings, location of discharges relative to critical areas, and the timing of discharges may need to be considered.

Some actions do not affect federally protected species or their critical habitats, but may affect state-protected species. Airport representatives should consider gathering information regarding state-specific species and habitat to ensure these impacts are properly documented and mitigated, if necessary.

3.2 Compare Project Effects to Regulatory Conditions

In some cases, demonstrating compliance with aquatic life and habitat regulations is a relatively straightforward process if development areas have no evidence of protected species or their critical habitat. In other cases, the evidence demonstrating the lack of presence is not definitive, and field surveys, plus extensive consultation with one or more regulatory agencies is required to demonstrate the lack of impacts. Gaining regulatory approval may require significant effort in demonstrating impacts and mitigation requirements and may involve extensive coordination with regulatory authorities.

If impacts to federally protected species will occur, formal consultation with regulatory agencies is required. Additional regulatory requirements, such as permit authorization or mitigation may also be applicable. Typically impacts to aquatic life and habitat are regional or state-specific, and regulatory agencies ultimately have the authority to determine if an impact exists based on the presented evidence.

3.3 Identify Required Controls and Modifications to Development Project

If development projects result in potential impacts to aquatic life and habitat, several measures can be taken to eliminate or minimize the impacts to a degree acceptable to the regulatory authorities. The preferred approach is to avoid impacts to aquatic species and habitat wherever possible. When complete avoidance of impacts conflicts with major development project objectives or requirements (i.e., hazardous wildlife attractants), consider the following measures:

- Construction during timeframes where aquatic life or habitat will be minimally impacted (i.e., outside of spawning season.)
- Modification of project characteristics to reduce or eliminate detrimental effects from water quality and water quantity.
- Implementation of controls to improve characteristics of discharged water.
- Limiting construction to time periods and locations that minimize habitat impacts.
- Construction of offsite habitat as mitigation for losses at the project site. Offsite mitigation may include the need for long-term monitoring of the mitigation areas to assess suitability and performance.
- Improvements in quality to existing habitats.
- Purchase of environmental or conservation easements to protect critical habitats and surrounding areas in perpetuity.

3.4 Prepare and Submit Compliance Documents

Management of aquatic life and habitat issues for new development projects or re-development projects involves a series of regulatory documents, some of which are identified below. Check with the regulator to determine which required applications or other submittals are needed. It is typically the responsibility of the airport operator to prepare these documents.

FAA must coordinate with the USFWS to assess the effects of proposed FAA actions on aquatic areas. Consultation with NMFS is needed for actions affecting anadromous fish (i.e., migrating) species and marine mammals. Also, FAA or the airport sponsor, as appropriate, must consult with state agencies having jurisdiction over affected aquatic resources.

A letter requesting information defining the presence of protected aquatic species or habitat must be sent to the regulating agencies. The letter should include information related to the proposed development, location, site plans, and any preliminary site assessment conducted for the site. Once the agency reviews the information, a biological assessment may be required to determine if the project will significantly impact aquatic life and habitat.

The biological assessment provides additional information about the species or habitat, potential impacts, and mitigation requirements. Although federal requirements do not protect state-protected species or habitats, environmental documents must be prepared for actions that affect state-protected species. After the agency reviews the documentation, they determine whether protected species or habitat could be impacted and if formal consultation is needed. If the biological assessment indicates that no listed or proposed species or critical habitat will be adversely affected, the consultation process is terminated.

An action that may affect federally listed species or habitat requires formal consultation with the airport, FAA, and associated regulatory agencies (e.g., USFWS, NMFS). Formal consultation includes a written request to the USFWS to determine if the action will jeopardize the continued existence of a species or severely change its habitat. Whenever waters are modified by a department or agency, adequate provisions must be made for the conservation, maintenance, and management of the resources and habitat.

TIPS FOR . . .
Determining the Measures Needed to Achieve Compliance

- Include aquatic life and habitat as part of an airport-wide Water Resource Inventory. Identify streams, wetlands, ponds, etc. within the airport's boundaries that potentially contain aquatic habitat and may require coordination with regulatory agencies in the event of a development activity.
- Request information from regulatory agencies, such as the USFWS, on the presence of known threatened and endangered species and potential critical habitat for general reference. The requested areas should include airport properties and properties surrounding the airport that could be affected by future airport development.
- For potential development areas where the presence of protected species and habitat may have significant potential to affect project goals, consider field surveys for potentially affected species when information from regulatory requests and literature reviews is not sufficient to definitely indicate the absence of the species and habitat.

- Consult with regulatory guidance, regulatory agencies, and local aquatic life specialists to confirm regional or state-specific species or critical habitat, and typical locations where these species are found.
- Site-specific information for the development site may not be available for aquatic life or habitat from the USFWS or NMFS. Conduct field surveys to assess whether protected species or habitats are present at the project site.
- Ensure qualified field personnel perform site visits, surveys, or biological assessments for threatened and endangered species or critical habitat.
- Gaining approval of regulatory authorities can require a significant effort in demonstrating impacts and mitigation requirements and often involves a significant degree of coordination with regulatory authorities. Coordinate with regulators to fully understand the timing requirements for the consultation and approval process.
- Determine if other permits or approvals are required to provide control or mitigation for the project. Permits not obtained in a timely fashion can delay the start of construction projects.
- Consider combinations of mitigation measures to achieve objectives when individual mitigation measures are insufficient.
- Contact appropriate federal or state agencies to discuss design measures to ensure avoidance or minimization of impacts to aquatic life and habitat.
- Include the results of biological assessments submitted to USFWS or NMFS in NEPA documentation.

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this fact sheet identifies the ways in which aquatic life and habitat planning and management can affect development project and project planning.

4.1 Siting and Construction of Development Project

Planning considerations for aquatic life and habitat compliance on the development project features and control infrastructure are provided below.

- If the development project contains protected aquatic species or critical habitat, documentation, consultation, and mitigation is required and management of aquatic life and habitat issues could become a significant project consideration. Planning activities with aquatic life and habitat impacts in areas with endangered species or regionally significant species can threaten the viability of the project. Options for modifying the project to avoid this situation should be explored.
- When assessing sites in the early project planning phase, the presence of protected species should be a significant factor in the decision-making matrix.
- Projects that indirectly impact aquatic species or habitat may require additional controls for water quality, discharge rates, or diversion to minimize impacts.

4.2 Airport Operations

Achieving compliance with aquatic life and habitat regulations may be integrally related to airport operations on new development projects and airport operations on existing developments.

Methods reducing operational impacts associated with the integration of the development project planning with aquatic life and habitat compliance planning are provided below.

- The need to move or modify a development project can result in the desired operational levels not being reached.
- The need for monitoring and maintenance of mitigation sites following construction can add ongoing costs and should be a consideration in assessing total project costs.
- The need and costs for monitoring, sampling programs, and maintenance of post-construction structural controls, collection, and treatment systems should be considered during early planning phases.
- Changes to locations and protocols for proposed airport operations (e.g., building locations, storm water controls, and deicing pads) may reduce project impacts and control needs.

4.3 Schedule and Sequencing

The process for assessing, demonstrating, and implementing compliance measures for aquatic life and habitat may be limited or a lengthy process, depending on the presence of protected species or habitat. Generally, if the USFWS or NMFS indicates that no listed or proposed species or critical habitat will be adversely affected, major alterations in the project schedule or sequencing are not expected.

If there is a potential for protected species or habitat to be located on the project site or be impacted from other development projects at the airport, the consultation and review process should be thoroughly reviewed to ensure this water resource issue does not impact project schedule. Site assessments, field surveys, agency reviews, and consultations may take several months to complete.

In some cases, the process for acquiring permits and approvals will overlap with the implementation of mitigation measures. It is important to acquire project-specific schedule information from regulators, environmental compliance staff and consultants, design engineers and construction personnel to prepare an overall schedule that effectively integrates and sequences the project steps.

Specific timeframes are applicable for the consultation and review process, as indicated below:

- The USFWS and NMFS must respond within 30 days after receiving an information request for protected species or critical habitat.
- A biological assessment must be completed within 180 days.
- Formal consultation takes place within a 90-day period.
- A determination from the USFWS or NMFS for a biological assessment will be made within 45 days after the formal consultation period ends.
- Concurrence with the findings presented in a biological assessment will be provided by the USFWS or NMFS within 30 days after receiving the assessment.
- A written request to comment on the USFWS or NMFS determination on a biological assessment must be submitted within 10 days before the end of the 45-day review period.

4.4 Project Costs

Major costs associated with compliance with aquatic life and habitat regulations generally include regulatory coordination, field surveys, biological assessments, mitigation, and the NEPA process. Capital costs may be associated with required controls for upstream development projects that impact aquatic life or habitat.

GUIDANCE FOR . . .
Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Data Collection	Perform consultation early in the Detailed Planning Phase to identify potential aquatic life or habitat issues. Adequately delineate protected species habitat, including downstream areas, of the project.
Storm Water Management	Consider the need for storm water controls for projects to minimize impacts to downstream aquatic life or habitat.
Design Implementation and Control Siting	Relocate project to avoid impacts to aquatic life or habitat or provide alternatives that minimize impacts.
Permit Acquisition or Approvals	Obtain information or perform site assessments in association with other permitting or approvals that may be needed.
Construction	Consider the possibility that controls and mitigation for other water resource issues (e.g., detention basins) could lead to impacts to existing species or habitat.
Stakeholder Coordination	Coordinate with regulators early to discuss potential documentation requirements and schedule.
Mitigation	Identify options to mitigate impacts and propose to agency for concurrence.

Fact Sheet 6
Coastal Zones and Barriers

The water resource issue category "Coastal Zones and Barriers" encompasses the impacts of airport development projects on coastal resources and the associated effects on water quality, biotic habitat, public safety, and infrastructure. This fact sheet presents guidance on planning for and managing the issues associated with coastal zones and barriers for airport development projects.

1.0 Description of Water Resource Issue and Impacts

Coastal resources occur at the interface between land and major bodies of water (e.g., Atlantic Ocean, Great Lakes, Gulf of Mexico, and Pacific Ocean). The resources include shorelines and beaches, coastal marshes, islands, coral reefs, and adjacent waters. Coastal resources are fragile because they are highly susceptible to erosion due to storms, wind, currents, and waves, and impacts associated with manmade changes and development. Coastal barriers are islands that occur along coastal areas and provide protection for the mainland against storm and wave impacts. Barrier islands are generally undevelopable due to their unstable geologic condition, but are essential to the protection of terrestrial and aquatic life and properties along mainland areas.

These resources are valued for their scenic and recreational properties, food supply, and habitat for a wide variety of aquatic and terrestrial species. Over half of the United States population lives within 50 miles of a coast, which represents only 17 percent of the country's land area (*12*). Nationally, there are many airports located near coastal areas, corresponding to the high rates of population in these areas.

Construction of facilities and infrastructure (e.g., sea walls, jetties, channels, piers) can have a direct physical impact on coastal resources. Development along the shoreline can also disrupt natural coastline processes (e.g., barrier island migration). Airport development is limited in coastal areas because regulations prohibit financial support. Allowable actions, however, do include funding for studies and necessary navigational equipment within coastal areas. Airport projects that change other airport features, such as land use, vegetation, grading, and increased storm water runoff can result in localized increases in erosion and sedimentation. New development projects also have the potential alter water quality and quantity. Non-point source industrial runoff and point source storm water discharges may contribute to degradation of water quality along the coast.

Below is a list of additional impacts that may result from development projects affecting coastal resources:

- Reduction of populations, habitat, health, biodiversity, and reproduction of aquatic and terrestrial species.
- Scenic value of coastal areas (*13*).

- Destruction of biotic habitat (*13*).
- Increased risk from storms, waves, etc.

Information on related water resource issues can be found in other fact sheets, as indicated below.

RELATED FACT SHEETS

Water Resource Issue Fact Sheet	Relationship
Physical Impacts to Wetlands and Other Surface Waters	Coordinate potential impacts to coastal resources with surface waters and wetlands regulations.
Aquatic Life and Habitat	Coastal resources provide habitat to a wide variety of aquatic species. Potential impacts to these species should be coordinated with considerations for managing aquatic life and habitat issues, especially for threatened and endangered species.
Hazardous Wildlife Attractants	Coastal resources may provide habitat to species that could be considered hazardous to coastal airports. Controls or management techniques for hazardous wildlife in coastal areas should be coordinated with managing coastal zone and barrier issues to minimize the potential for impacts to coastal resources.
Surface Water and Groundwater Quality	Coordinate water quality requirements for potential discharges from projects that could impact coastal resources.
Storm Water Quality and Floodplains	The Federal Emergency Management Agency (FEMA) plays a role in enforcing regulations for coastal zones and barriers and floodplains. Coordinate potential project impacts to coastal resources with potential floodplain impacts.

2.0 Identification of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the potential effects of impacts to coastal zones and barriers from development projects for the protection of ecological resources, water quality, and public safety. Section 2 of this fact sheet provides the following:

- A summary of the coastal zone and barrier regulations associated with impacts typically applicable to airports.
- A methodology for identifying the core regulatory requirements generally applicable to each airport locale.

2.1 Summary of Core Regulatory Requirements

Regulation of coastal zones and barriers occurs primarily through the Coastal Zone Management Act (CZMA), regulated under 15 CFR 923 and 930, as amended by the Coastal Zone Management Reauthorization Amendments of 1990 (23 CFR 650.211) and the Coastal Zone Protection

Act of 1996; and the Coastal Barrier Resources Act (CBRA), as amended by the Coastal Barrier Improvement Act of 1990.

The CZMA requires that any development projects with the potential to impact a state's coastal zone comply with requirements of the federally approved state coastal zone management program (if the project is being performed or funded by the federal government). The objectives of the CZMA include:

- Ensuring that federal actions in the coastal zone are coordinated with state coastal management programs.
- Controlling development in high-risk coastal areas.
- Allowing for prioritization of development in coastal areas for uses that are coastal-dependent.
- Conserving coastal ecological and economic resources.
- Allowing the public to access coastal areas for recreation purposes (*14*).

The CZMA is implemented by the states, with federal oversight from the National Oceanic and Atmospheric Administration (NOAA). As authorized under this act, NOAA implements the National Coastal Zone Management Program, in partnership with states, through their Office of Ocean and Coastal Resource Management (OCRM) (*15*). The Federal Emergency Management Agency (FEMA) provides guidance and consultation to the states, and is the primary agency responsible for emergency management in coastal zones, as well as implementation of the National Flood Insurance Program (NFIP). The United States Army Corps of Engineers (USACE) is responsible for maintaining commercial navigational waterways, including those in coastal zones.

Although the CZMA itself does not require any specific permits or approvals, it does require coordination between state and federal agencies. Federal agencies performing the action with a potential to impact a state's coastal zone are required to review the state's coastal management plan and planned project activities, perform an evaluation of whether the action will violate the plan, and make a consistency determination (*16*). The agencies must then inform the state of the determination (*14*). State programs may include specific permitting or approval requirements. In some cases, states may delegate permitting authority for coastal areas to local governments or regional authorities.

The CBRA prohibits the use of new federal funds for development or actions occurring within the Coastal Barrier Resource System (CBRS). Financial assistance prohibited includes FAA grants for airport planning and development, other than for environmental studies or necessary navigational equipment, and flood insurance and disaster assistance from FEMA. West Coast states bordering the Pacific Ocean are not included under CBRA, however they may have state or local requirements addressing the same objectives (*14*). The law is not applicable to projects involving only private funds or non-federal funds (*17*). The objective of this act is to discourage development within the coastal barrier islands, which serves multiple purposes, including:

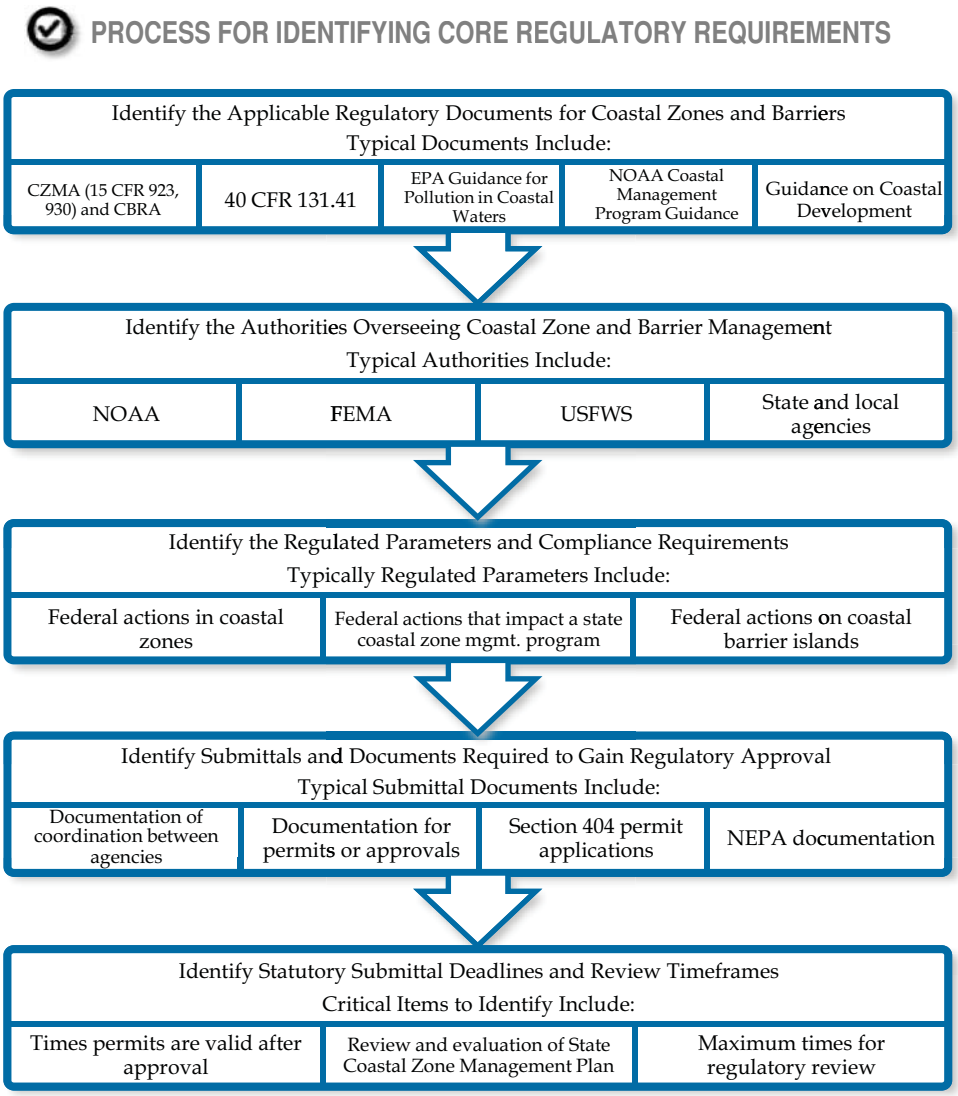
- Protection of barrier island geological and ecological resources, including aquatic habitat for a diverse range of species, which may be impacted by development.
- Preservation of the barrier islands themselves, which provide protection to the mainland coastal areas and inland waters, as well as their inhabitants, from forces of nature such as currents and storm effects; and
- Protection of human life and property by minimizing development and habitation of barrier islands, which may be geologically unstable and highly susceptible to storm and wave damage.

The CBRA does not require any specific federal permits or approvals outside of the National Environmental Policy Act (NEPA) process. As part of NEPA, it must be demonstrated that the airport has consulted with the U.S. Fish and Wildlife Service (USFWS) in planning for the proposed development action. Airport representatives should also consult with their state regulatory agencies to confirm whether any state or local permits or approvals may be required.

Coastal zones are also regulated through the National Oceanic and Atmospheric Administration (NOAA) regulations on federal coastal zone consistency. This means that states with approved coastal zone management programs can review federal permits and activities for consistency with their state plan. Projects with federal funding require either a federal consistency determination (that activities are consistent with the state plan) or a negative determination (that the activities will not affect coastal resources).

The Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) (33 U.S.C. 1401–1445 and 16 U.S.C. 1431–1445) prohibits dumping of material into the United States' oceans waters with the potential to endanger or degrade human health or the marine environment (*18*). Although this law does not have a specifically associated regulation, it is regulated through the National Pollutant Discharge Elimination System (NPDES) and Clean Water Act (CWA) Section 404 permitting programs (refer to the Surface Water and Groundwater Quality Fact Sheet and Physical Impacts to Wetlands and Other Surface Waters Fact Sheet).

As discussed in Section 2 of the Handbook, it is recommended that airport representatives identify and document the core regulatory requirements associated with each water resource issue before planning begins. The figure below identifies a methodology for identifying those core requirements. The figure also includes references to commonly found results from that analysis.



TIPS FOR . . .
Identifying Core Regulatory Requirements

- Acquire information on local coastal issues from municipalities and watershed management groups.
- Identify local and state regulatory authority over coastal zones and barriers and review applicable requirements during early planning phases.
- Work with regulatory agencies to identify potentially acceptable mitigation options if coastal resource impacts cannot be avoided. Depending on the state, mitigation options may include an individual mitigation project, the purchase of credits for an approved mitigation bank, or monetary contributions to a restoration fund or mitigation account. Mitigation options are typically preferred to be within the same type of habitat, ecological value, and hydrogeologic basin as the location of the impact (*19*).
- Permits or approvals may be required at a state or local level for particular non-exempt activities that cannot be avoided, and may specify conditions for compensatory mitigation. Approvals for activities in coastal wetlands and surface waters may be part of the regulatory processes described in the Physical Impacts to Wetlands and Other Surface Waters Fact Sheet. Non-exempt activities may include structures, discharge or disposal of materials, grading or dredging, mining or extraction, changes to land use or water use, changes to coastal access, and removal of vegetation outside of approved uses (*20*).

3.0 Determination of the Measures Needed for Compliance

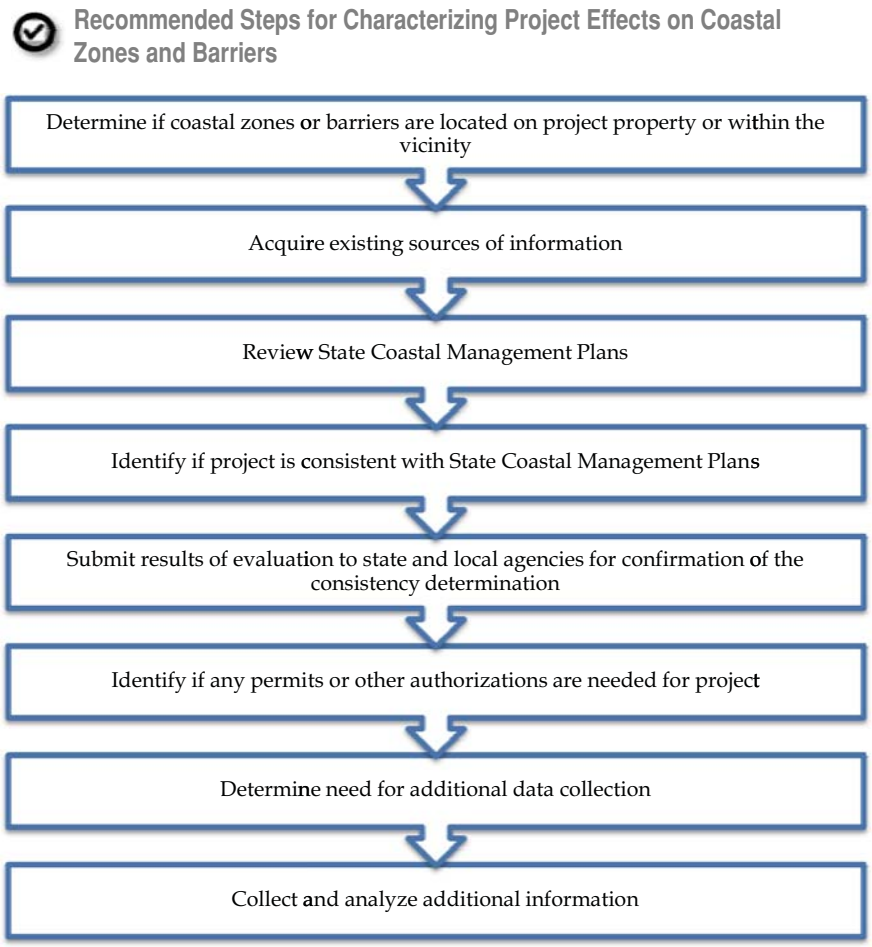
Section 3 of this fact sheet presents a methodology for determining the means of achieving compliance that is specific to each project.

3.1 Characterize Project Effects

Characterizing effects of a development project on coastal zones and barriers first requires collection of information that will allow comparison of planned project development actions and locations with protected coastal resources.

Airport operators must consider the specific actions associated with the development project, including construction and siting and long-term actions. A review of actions that extend into coastal areas, potential sources of impacts, and physical impacts to coastal areas and associated resources is necessary to characterize project effects. Potential funding sources are also an appropriate consideration, as both the CZMA and CBRA only regulate federal actions or actions that are federally funded.

There are multiple resources available for identifying coastal resources (e.g., state's coastal zone management programs, state's coastal management agency, or the OCRM) to identify coastal resources in the vicinity of the development project. Coastal classifications and maps are also available. Coastal barriers in the CBRS, which are identified by the USFWS and authorized by Congress, are documented by FEMA on Flood Insurance Rate Maps (FIRM). Airport aerial site photos and base maps may also provide important information pertaining to coastal zones and barriers.



3.2 Compare Project Effects to Regulatory Conditions

Demonstrating compliance with regulatory conditions for the CZMA generally requires a review and evaluation of the state coastal zone management program for consistency with project development actions. These programs may include specific requirements for analyses to determine compliance with state regulations, threshold values for potential impacts, authorized and prohibited development actions, in addition to required permits and approvals and permitting authorities. Agencies must also perform an evaluation of whether the action will violate the state's coastal management plan, and make a consistency determination.

A comparison of project actions with regulatory conditions for the CBRA will first involve consultation of CBRS resources indicated on local FIRMs and a comparison of those boundaries to project limits of construction.

3.3 Identify Required Controls and Modifications to Development Project

Airports will need to evaluate controls required to minimize impacts to coastal resources, including those required to comply with regulations described in other fact sheets (Surface Water and Groundwater Quality, Storm Water Quantity and Floodplains, and Physical Impacts to Wetlands and Other Surface Waters). In complying with the CZMA, airports or their designated experts will need to refer to the state coastal zone management program plan and then coordi-

nate with state coastal zone management agency officials to confirm any additional controls that may be needed to protect designated coastal zones.

Coordination will also be required with the USFWS to determine if any specific conditions or controls will be necessary to make planned development actions acceptable under the requirements of the CBRA.

3.4 Prepare and Submit Compliance Documents

Although the CZMA itself does not require any specific permits or approvals, it does require coordination between state and federal agencies. The agencies must inform the state of the results of the determination of consistency with the state's coastal management plan.

The CBRA does not require any specific permits or approvals outside of the NEPA process. As part of NEPA, it must be demonstrated that the airport has consulted with the USFWS in planning for the proposed development action.

In addition to any permit requirements associated with other water resource issues for development actions within coastal areas, other compliance documents such as permit applications or design drawings may need to be submitted to be compliant with state or local coastal management programs.

TIPS FOR . . .

Determining the Measures Needed to Achieve Compliance

- Include coastal zones and barriers in an airport-wide Water Resource Inventory, including those in the vicinity of the airport or development project and those receiving surface water discharges from the airport.
- Adequately delineate coastal zones to avoid impacting these resources without regulatory approval.
- Coordinate with authorities early in the project implementation process. Consult with state and local agencies and the USFWS (as required by the NEPA) and confirm whether planned development associated with federal funding or activities would be acceptable or prohibited by CBRA.
- Hold a pre-application meeting with state and local regulators to help identify permit type and documentation needs, and actively engage them throughout the permit process.
- Ensure documentation from consistency evaluation is complete when submitted and is received by the state coastal management agency. This will help reduce delays due to missing information.
- Identify agencies or public groups with special interests with coastal resources. There is sometimes significant political and community input to impacts associated with particular high-value resources, especially in coastal areas, which can cause significant delays in the NEPA process. If airport operators are aware of potentially significant public interest, the project may benefit by eliminating project alternatives that are unlikely to be approved.
- Consider low impact development or construction approaches using publicly available guidance documents and resources, including those published by the Urban Land Institute as well as regulatory authorities. Incorporate these approaches into NEPA documentation.

- Consider the possibility of construction impacts to coastal zones or barriers that may be associated with staging and storage areas, access roads and parking, excavation and disposal sites, and obstructions to coastal access. Consider the need for potential protective measures during construction activities, or potential changes to limits of construction, construction phasing, or material staging areas, that may minimize the potential for impacts to coastal zones and barriers (*20*).

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this fact sheet identifies the ways in which coastal zone and barrier planning and management can affect development project planning and implementation.

4.1 Siting and Construction of Development Project

In previous sections, it was indicated that achieving compliance with coastal zone and barrier regulations can result in the need for mitigation and the need to modify the development project features. Planning considerations for reducing the effect of compliance with coastal resource regulations on the development project features and mitigation measures are provided below:

- Relocation of the entire project to avoid coastal zone impacts must be considered and may be necessary if significant public or regulatory resistance is encountered. Having alternate sites for the development project, if feasible, may reduce delays if a change is made.
- In some cases, only portions of a project may need revision of project function or scope to avoid or minimize coastal zone or barrier impacts. Flexibility of development project design will allow for more opportunities to adapt to regulatory constraints as they arise.
- When assessing sites in the early project planning phase, the presence of wetlands, especially high quality wetlands, should be a significant factor in the decision-making matrix.
- Consider changes to project design to avoid or eliminate particular design features or land uses that may be prohibited or discouraged under local coastal management programs (e.g., elimination of an air strip).
- Use specialized construction techniques, approaches, or equipment, to minimize potential impacts that may occur during construction activities.

4.2 Airport Operations

Achieving compliance with coastal zone and barrier regulations may result in changes to post-construction airport operations. Methods reducing operational impacts associated with the integration of the development project planning with coastal zone and barrier compliance planning are provided below:

- The need to move or modify a development project can result in the desired operational levels not being reached.
- The need for monitoring and maintenance of coastal zones following construction can add fairly significant costs and should be a consideration in assessing total project costs.
- Alterations in industrial activity areas to avoid impacts to coastal areas (e.g., location of chemical storage or fuel islands) may result in changes to the layout of airport operational areas.
- Consider the need for ongoing maintenance for coastal barriers and storm water controls that were needed to mitigate or minimize coastal impacts, may require significant effort and staff.

- Impacts to coastal resources may become necessary due to aircraft safety issues. The airport's policies and position on coastal zones and those of the FAA should be clearly presented to the regulatory authority governing the mitigation decision.

4.3 Schedule and Sequencing

The primary schedule components associated with coastal zones and barriers include:

- Identification and review of state and local requirements for coastal zone management programs
- Evaluation of project development actions for consistency with coastal zone management programs
- Review of development actions with respect to CBRS data to evaluate compliance with CBRA
- Regulatory coordination and consultation
- Identification of controls and modifications to minimize or mitigate for potential coastal resource impacts
- Permitting and approvals
- NEPA process

4.4 Project Costs

Major costs associated with compliance with coastal zone and barrier regulations generally include the development of project modifications or controls necessary to be compliant with the CZMA and CBRA, permitting and regulatory coordination, and the NEPA process. Property acquisition may be necessary for mitigation or controls, which typically require significant capital costs.

GUIDANCE FOR . . .
Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Data Collection	Consult with state agency to confirm coastal zone boundaries.
Design Development and Control Siting	Avoid direct impacts to coastal zones or barriers. Coordinate on the siting and design of controls and discharges associated with other airport projects that could affect coastal zones.
Stakeholder Coordination	Coordinate with the FAA and state agency to determine whether there are controls or design modifications that may help to minimize potential coastal impacts. Consult with state agencies to identify required permits and approvals and potential timeframes to be incorporated into project planning.
Documentation	Submit complete documentation associated with consistency evaluation and in accordance with state-specific requirements.
Construction	Verify that regulatory agencies have fully completed consultation, coordination, and permitting authorizations before conducting project work.
Mitigation	Coordinate with state agency to determine whether mitigation may be required to address coastal impacts.

Fact Sheet 7
Wild and Scenic Rivers

The water resource issue category "Wild and Scenic Rivers" encompasses the impacts of airport development projects on protected river corridors and upstream modifications and the associated effects on the outstanding natural, cultural, and recreational values of these resources. This fact sheet presents guidance on planning for and managing Wild and Scenic Rivers associated with airport development projects.

1.0 Description of Water Resource Issue and Impacts

Wild and Scenic Rivers are a category encompassing three protected river designations. Wild Rivers are considered the most primitive type of river, and are largely inaccessible, except by trail. Scenic Rivers are more accessible but are largely undeveloped. Recreational Rivers are readily accessible and may have incurred development or undergone some diversion in the past. A fourth category, Study Rivers, include rivers or river segments being considered for potential addition to the Wild and Scenic Rivers System.

Airport development projects that would affect the free-flowing characteristics of a Wild and Scenic River, the Outstandingly Remarkable Values (ORVs) for which the Wild and Scenic Rivers were designated (i.e., scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values), or rivers identified for study are restricted. This includes projects within the river, in the protected corridor around the river, and projects upstream or outside of the corridor that would invade or diminish the designated values of the river. Airport development projects could directly impact Wild and Scenic Rivers or areas downstream. Specific impacts to Wild and Scenic Rivers include:

- Clearing trees or brush
- Construction of a new outfall
- Construction of detention basins, affecting runoff into the river
- Rerouting of flow to accommodate new development
- Increases in pollutants in runoff from changes to, or increases in airport operations
- Changes to the volume of runoff from increased impervious surfaces
- Increased sediment in runoff from construction
- Development in the river or protected corridor
- Removal of wetlands or natural ponds
- Increases in noise
- Demolition of historic structures/archeological grounds, or significant river geology
- Changes to roadways that would affect access to a recreational river
- Development of buildings or lighting that would affect scenic quality of river

Information on related water resource issues can be found in other fact sheets, as indicated below.

RELATED FACT SHEETS

Water Resource Issue Fact Sheet	Relationship
Hazardous Wildlife Attractants	Wild and Scenic Rivers may have characteristics that result in hazardous wildlife attractants.
Surface Water and Groundwater Quality	Coordinate water quality measures with Wild and Scenic River characteristics.
Surface Water Quantity and Floodplains	Coordinate detention basin implementation for storm water quantity with Wild and Scenic River requirements. Floodplains may be associated with a Wild and Scenic River.
Physical Impacts to Wetlands and Other Surface Waters	Impacts to surface waters or wetlands may be associated with Wild and Scenic Rivers. Coordinate impact and mitigation measures.
Aquatic Life and Habitat	Coordinate mitigation for removal of brush and trees for height restriction requirements.

2.0 Identification of Core Regulatory Requirements

Regulations have been developed at various governmental levels to address the impacts to Wild and Scenic Rivers from development projects on their natural, cultural, and recreational values. Section 2 of this fact sheet provides the following:

- A summary of the Wild and Scenic River regulations typically applicable to airports.
- A methodology for identifying the core regulatory requirements generally applicable to each airport locale.

2.1 Summary of Core Regulatory Requirements

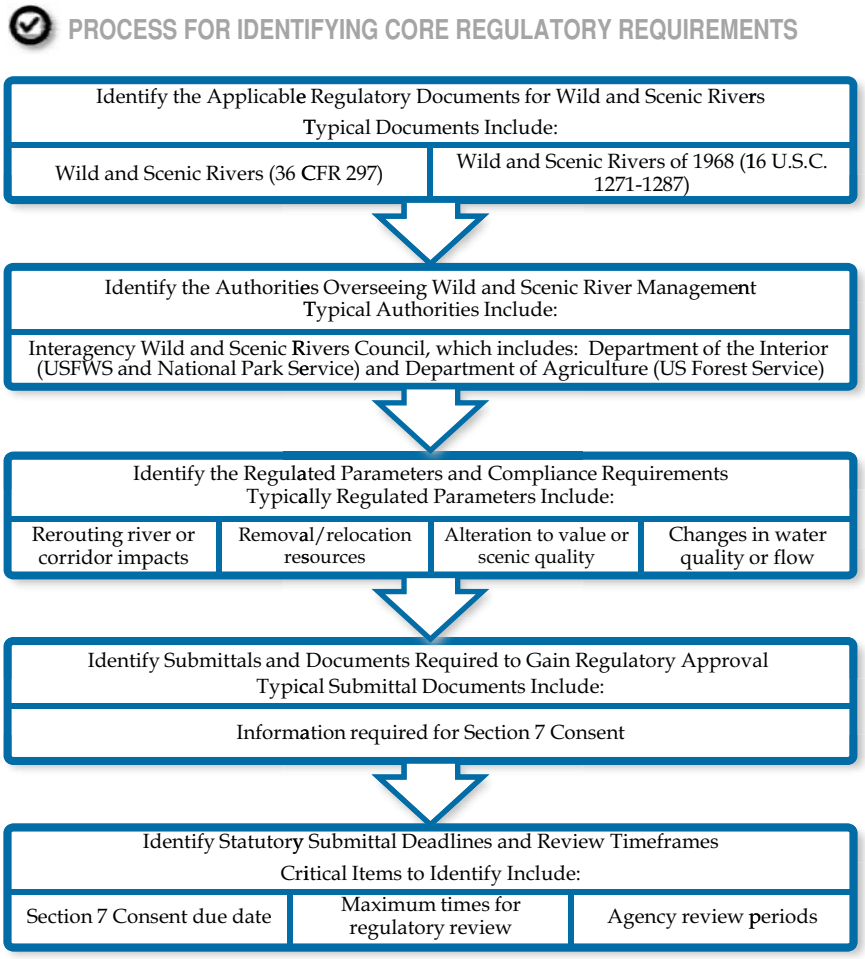
The National Wild and Scenic Rivers System was created by Congress in 1968 through the Wild and Scenic Rivers Act (Act) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers or portions of rivers are designated as Wild, Scenic, or Recreational, by an act of Congress or by the Secretary of the Interior at the request of a state governor (*21*). Rivers are added to the System on the basis of free-flowing conditions, water quality, and ORVs, which are identified predesignation during the preparation of a Comprehensive River Management Plan (CRMP). Federal agencies that are responsible for managing a particular stretch of river [including United States Bureau of Land Management (BLM), United States Forest Service (USFS), United States Fish and Wildlife Service (USFWS), United States National Park Service (NPS)] are required to develop a CRMP that provides for the protection of designated river values as well as describes requirements for land development in the vicinity of the river. State agency-managed rivers do not require a Comprehensive River Management Plan, but the agency may propose a management program. The classification as Wild, Scenic, Recreational, or Study River does not necessarily represent the river's ORVs but describes the extent of development at the time of the river's designation.

The Act is intended to safeguard the special character of Wild, Scenic, or Recreational rivers, while also recognizing the potential for their appropriate use and development. The Act covers

rivers and a designated corridor measured from the high water mark (typically ¼-mile). The Act prohibits water resource projects in a protected corridor around the river and protects designated rivers from effects of projects upstream. The Act also prohibits federal agencies from assisting by loan, grant or license, any water resource project that would have a direct and adverse effect on the designated values of a Wild and Scenic River.

Federal agencies that fund, license, or authorize work affecting Wild and Scenic Rivers must obtain consent from the federal agency managing the river. Federal agencies must advise the Secretary of the Interior or Secretary of Agriculture, and report to Congress in advance of any water resource project for which they plan to recommend authorization or request appropriations that would be in conflict with the Act. Section 7 of the Act creates a requirement for consultation between the managing agency and the federal agency funding or assisting the development project (*22*). Early on in the project planning process, the managing agency will also coordinate its review with other agencies, depending on the type of project, including USFWS, the National Marine Fisheries Service (NMFS), the U.S. Environmental Protection Agency (USEPA), and state agencies. Consent (also called Section 7 Consent) must be received before the activity is approved. The managing agency may also be invited to be a cooperating agency in the National Environmental Policy Act (NEPA) process. If a designated river is affected, the potential effects of the development project must be characterized with respect to the designated uses and mitigation measures may be necessary to prevent adverse impacts.

As discussed in Section 2 of the Handbook, it is recommended that airport representatives identify and document the core regulatory requirements associated with each water resource issue



before planning begins. The preceding figure identifies a methodology for identifying those core requirements. The figure also includes references to commonly found results from that analysis.

TIPS FOR . . .
Identifying Core Regulatory Requirements

- Determine if project has the potential to impact protected corridor zones or change the designated values (i.e., scenery, geology, fish and wildlife, historic resources, cultural resources) of Wild and Scenic Rivers.
- Understand if airport property contains use restrictions with respect to Wild and Scenic River issues.
- Consult with the agency that manages the river (Fish and Wildlife Service, National Parks Service, Bureau of Land Management, U.S. Forest Service) and provide the agency with environmental reports and documentation regarding the potential project.
- Coordinate with regulators in assessing whether Wild and Scenic River regulations are applicable or suitable to airport development projects. For example, regulatory requirements may create a wildlife hazard attractant, which may conflict with airport safety requirements and policies.
- Determine the level of detail that needs to be submitted for Section 7 Consent.
- There are a variety of available resources for understanding the core regulatory requirements for this issue, including the National Wild and Scenic Rivers System website, which provides primers, reference guides, authorities of key federal agencies, a searchable database of frequently asked questions about Wild and Scenic Rivers topics, and technical reports of the Interagency Wild and Scenic Rivers Coordinating Council (*23*).

3.0 Determination of the Measures Needed for Compliance

Section 3 of this fact sheet presents a methodology for determining the means of achieving compliance that is specific to each project.

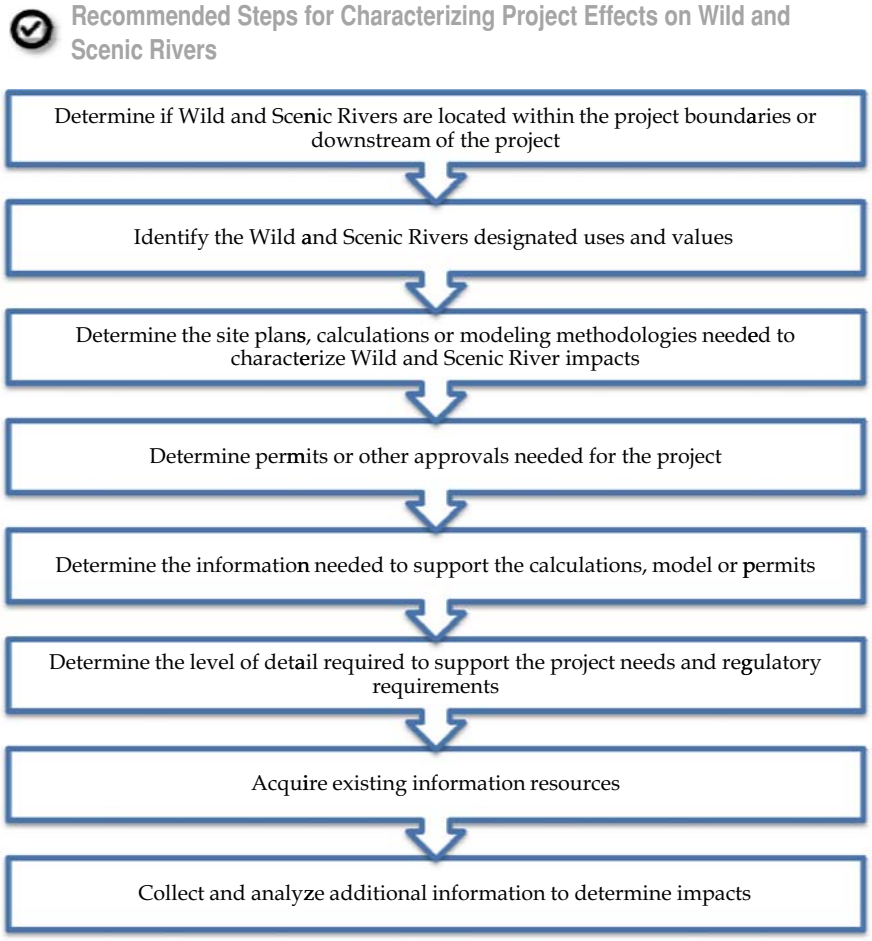
3.1 Characterize Project Effects

Characterizing the effects of a development project on Wild and Scenic Rivers requires an understanding of how the project affects these resources and an understanding of the core regulatory requirements. Airport representatives must identify federal or state Wild, Scenic, Recreational or Study rivers located in the vicinity of the airport. For each regulated river, it is important to characterize the designated values and federal agency managing the river. It is beneficial for airport operators to gather specific information about the proposed development project to facilitate characterization of potential impacts to any regulated rivers.

Information to help characterize project effects on Wild and Scenic Rivers may be obtained from the sources identified below:

- Part 150 Noise Study
- Airport Storm Water Pollution Prevention Plan maps
- Airport base and utility drawings
- Airport Layout Plan

- Airport Master Plan/System Plan
- GIS systems/databases
- Site studies and surveys
- Design and record drawings
- Public resources (USGS, NOAA)
- Consultation with managing agencies and regulators
- Endangered species studies and reviews
- Wetland and stream delineations



3.2 Compare Project Effects to Regulatory Conditions

A development project's boundaries and construction footprints, or alterations to the Wild and Scenic River's values (i.e., water quality, recreational values) must be compared to the existing conditions to identify potential impacts. This may require performing site assessments, or calculations for storm water quantity, water quality, physical impacts, or noise. The following airport features and boundaries can help facilitate identifying these impacts:

- Part 150 noise boundaries
- Watershed boundaries
- Impervious area
- Storm water detention areas
- Pollutant load changes from changes to operations

- Pollutant load changes for relocation, or changes to airport industrial operations, including:
  - Airport lighting or Navigational Aid System (NAVAIDS)
  - FAA safety boundaries
  - Sediment in runoff
  - Developed areas
  - Airport property boundary

Following this analysis, coordination is required with the managing agency to determine if development project features could adversely affect the Wild and Scenic River by:

- Destroying or altering the river's free-flowing nature.
- Introducing a visual, audible, or other type of intrusion.
- Causing the river's water quality to deteriorate.
- Allowing transfer or sale of property interests without restrictions needed to protect the river or its protected corridor.

It is recommended that the managing agency be consulted with as soon as potential impacts have been identified, due to the need for interagency coordination and review, in order to prevent project delays (*22*).

3.3 Identify Required Controls and Modifications to Development Project

Because federal agencies may not provide loans, grants, licenses, or authorization for projects that would have a direct or adverse effect on Wild and Scenic Rivers, modifications to project features or mitigation measures may be required, including those listed below. The appropriate controls must be selected to meet regulatory criteria, and assessments reviewing project siting, operations, and ongoing maintenance may need to be conducted. Recommendations from managing agencies may need to be incorporated into the project design and considered in the NEPA process. Design features may need to be updated if impacts with the potential to affect Wild and Scenic Rivers arise. Potential design features include:

- Relocation of project outside of the protected corridor boundaries.
- Relocation of project to prevent increases in noise or light in protected corridor.
- Additional sediment and erosion controls during construction.
- Deed or lease restrictions on property use.
- Restrictions on industrial operations in watersheds that drain to the Wild and Scenic Rivers to meet water quality standards.
- Water quantity controls to prevent increased flooding risk.
- Modifications to new outfalls.

3.4 Prepare and Submit Compliance Documents

Federal agencies that fund, license, or authorize work affecting Wild and Scenic Rivers must provide notice and obtain Section 7 Consent. Project information must be submitted to the Secretary of Agriculture or Secretary of Interior no later than 60 days prior to the proposed action, which includes:

- Name and location of the affected river
- Location of the project
- Nature of the permit or other authorization proposed for issuance
- Description of the proposed activity
- Any relevant information, such as plans, maps, and environmental studies, assessments, or environmental impact statements

TIPS FOR . . .

Determining the Measures Needed to Achieve Compliance

- Include Wild, Scenic, Recreational, and Study Rivers within the airport's watersheds as part of an airport-wide Water Resource Inventory. Also include protected river corridors and nearby wetlands.
- For each regulated river that is identified, identify the values assigned to the river or proposed to be assigned to the river in the Wild and Scenic Rivers System, as well as which agency is the managing agency for the river.
- Identify site selection for future development projects that are outside of Wild and Scenic River corridors, or avoid discharges to Wild and Scenic Rivers.
- The choice of calculation methods and models will depend upon parameters needed to facilitate the project design, project complexity, schedule, cost, and the degree of accuracy required. These calculations should be performed by appropriately qualified engineers and modelers.
- Ensure Section 7 Consent includes all required information for submittal and any additional information or plans that may facilitate the review process. This may require finalizing design calculations for drainage infrastructure, controls or developing final drawings and reports required by regulatory authorities.
- If NEPA documentation is required, ensure the FAA invites the managing agency to be a cooperating agency during the NEPA process. Include recommended measures and correspondence from the managing agency in NEPA documents. The Record of Decision may include avoidance and mitigation measures and a monitoring/enforcement plan.
- Coordinate with stakeholders and managing agencies throughout the development process to keep them informed of any project changes.
- Modifications to the project's features and mitigation measures may be necessary to prevent adverse impacts. Submit proposed mitigation measures to the managing federal agency at least 60 days before the start of the project. Work with the agency to agree on recommended measures to mitigate effects from the project.
- Information on ORVs can be found at the Nationwide Rivers Inventory (NRI) website (*24*).
- Information on Wild and Scenic River classification and managing agencies, as well as viewable and printable maps and GIS files of river locations can be found at the Wild and Scenic Rivers System website (*23*).

4.0 Reduction of Water Resource Issue Effects on Development Projects

Section 4 of this fact sheet identifies the ways in which Wild and Scenic River planning and management can affect development project and project planning.

4.1 Siting and Construction of Development Project

Planning considerations for reducing the effect of compliance with Wild and Scenic Rivers regulations on the development project features and mitigation measures are provided below.

- Land use property restrictions for development should be identified in the early stages of planning to minimize time and budget used for project design.

- Relocation of the entire project to avoid Wild and Scenic River impacts may be a necessary if significant public or regulatory input is encountered. Having alternate sites for the development project, if feasible, may reduce delays if a change is made.
- In some cases, only portions of a project may need revision of project function or scope to avoid or minimize Wild and Scenic River impacts. Flexibility of development project design will allow for more opportunities to adapt to regulatory constraints as they arise.
- When assessing sites in early project planning phases, the presence of Wild and Scenic Rivers should be a significant factor in the decision-making matrix.
- If multiple projects are foreseen that may impact Wild and Scenic Rivers, use of erosion and sediment construction controls or post-construction water quantity and quality controls should be considered to minimize the cost and schedule implication associated with future project impacts.

4.2 Airport Operations

Achieving compliance with Wild and Scenic River regulations is typically influenced by both construction-phase and post-construction airport operations. Methods reducing operational impacts associated with the integration of the development project planning with Wild and Scenic River compliance planning are provided below.

- Restrictions on location or types of airport operations (e.g., deicing, fueling, maintenance) that occur in areas tributary to the river.
- Maintenance required for structural water quantity and quality controls.
- Reduced revenue from tenant operations, parking areas, or buildings as a result of non-development for compliance.
- Reduced ability for future development due to use of available land.

4.3 Schedule and Sequencing

The process for assessing, demonstrating, and implementing compliance measures for Wild and Scenic Rivers can be lengthy and integrally related to the planning, permitting, design, and construction of the development project itself. Items that typically have the most significant impact on schedule are shown in the table on the following page.

The sequencing of these activities in relation to the development project is critical. Failure to adequately identify and collect data can be a significant setback in the ability to stay on schedule. Failure to integrate the permitting, design, and construction schedules for the development project can have cascading impacts on schedule as well.

In most cases, the process for acquiring approvals will overlap to some degree with the implementation of compliance measures and the overall development project implementation process. It is important to acquire project-specific schedule information from regulators, environmental compliance staff and consultants, design engineers and construction personnel to prepare an overall schedule that effectively integrates and sequences the project steps.

The following aspects of management of the Wild and Scenic Rivers are major components of the schedule for assessing, demonstrating, and implementing compliance measures:

- Identification of potential impacts
- Coordination with regulatory agency
- Preparing documentation for NEPA
- Selection and design of additional controls, if required
- Construction of controls

Project and proposed mitigation measures must be submitted to the Secretary of the Interior or the Secretary of Agriculture 60 days prior to the project starting. FAA cannot provide funding, licenses, or authorization until the Secretary of the Interior or the Secretary of Agriculture has approved the project.

If sufficient coordination with the river's managing agency has not occurred prior to the submittal to identify adequate mitigation measures approved by the managing agency, and if mitigation measures have not been incorporated into the NEPA documents, the Secretary may reject the submittal, delaying the project.

4.4 Project Costs

Identification of Wild and Scenic Rivers in the vicinity of the airport is important to identify potential project costs. This knowledge can help to inform decisions about project siting and agencies or stakeholders that require consultation. These entities may help identify the most cost-effective solutions for avoiding or mitigating for potential impacts.

The following items may result in significant incurred cost by minimizing adverse effects to Wild and Scenic Rivers:

- Additional erosion and sediment controls to mitigate project impacts during construction
- Water quality or water quantity controls
- Restrictions on airport operations (deicing, fueling, maintenance areas)
- Changes to project scope or layout
- Cost of coordination with the managing agency for the river
- Cost of preparing documentation for NEPA

GUIDANCE FOR . . .

Reducing Potential Cost and Schedule Impacts

Item	Factors that Can Reduce Cost and Shorten Schedule
Water Resources Inventory	Understand location of Wild and Scenic Rivers early in the project implementation process.
Modeling, Calculations, and Analyses	Identify appropriate level of detail and specific methods required by agencies when calculating water quality-related impacts.
Data Collection	Collect additional information beyond the project footprint to ensure downstream impacts are avoided.
Control Siting	Identify potential sites in Conceptual Planning Phase.
Design Implementation	Design controls that meet the project needs outside of Wild and Scenic River corridors. Coordinate with development project construction.
Staffing	Identify the expertise needed, select qualified experts, and bring them in at the right time.
Stakeholder Coordination	Coordinate with regulators in Conceptual Planning and Detailed Planning Phases including discussions of funding, authorizing and NEPA lead agency, especially if impacts necessitate the need to ensure aircraft safety. Coordinate early with stakeholders such as airlines, regulators, various airport departments, and communities to avoid multiple iterations of permitting and design.
Maintenance	Design project so that maintenance needs are minimal.
Permit Acquisition or Approvals	Coordinate permit approval documentation needs with agencies during the planning process.

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APPENDIX C

Overview of the NEPA Process

Contents

Introduction

Appendix C provides an overview of the process for complying with the National Environmental Policy Act (NEPA), as it relates to both project planning and the management of potential water resource issues. NEPA requires federal agencies to evaluate the environmental impacts of any proposed agency major federal action.

Although airport sponsors are responsible for deciding when and where airport development is necessary, the NEPA process is triggered when an airport sponsor seeks FAA approval, which constitutes a "federal action." Examples include approval for changes to the Airport Layout Plan (ALP), for use of Airport Improvement Program (AIP) funds to implement a project, and for use of Passenger Facility Charges (PFC) funds to implement a project.

Purpose of NEPA

The purpose of NEPA is to "help public officials make decisions that are based on understanding of environmental consequences and take actions to protect, restore, and enhance the environment." To meet NEPA requirements, the FAA must prepare the appropriate level of documentation to analyze the proposed actions and their impacts. To facilitate compliance with its NEPA duties, the FAA has issued guidance to comply with NEPA and the White House Council on Environmental Quality (CEQ).

NEPA Regulatory Framework

To aid airports in compliance with NEPA, the FAA has issued guidance in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures* (*1*), FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (*2*), and the associated *Environmental Desk Reference for Airport Actions* (*3*).

FAA Order 1050.1E and 5050.4B establish the FAA's policies and procedures for compliance with NEPA and the implementing regulations issued by the CEQ (40 C.F.R. 1500–1508). These Orders and regulations require a thorough and objective assessment of the proposed action, the no action alternative, and all "reasonable" alternatives that would achieve the stated purpose and need of the proposed action.

Order 1050.1E provides agency-wide procedures for compliance with NEPA and implementation of regulations issued by the CEQ. The Order describes three different levels of NEPA review (presented in order of least intensive analysis due to no anticipated impacts to most intensive analysis due to anticipated impacts): Categorical Exclusion (CatEx), Environmental Assessment (EA), and Environmental Impact Statement (EIS). Differences in each level and the associated coordination and documentation required are evaluated in Order 1050.1E (and discussed in Section 4 of this Appendix). The Order also includes guidance for integration of NEPA into the planning process. Appendix A of Order 1050.1E identifies the environmental impact categories considered in FAA documents, including water resource issues (i.e., wetlands; floodplains; water quality; coastal zone management; plants, fish, and wildlife; and wild and scenic rivers) that need to be assessed for federal actions, and the breadth of analysis required for each category.

FAA Order 5050.4B expands on Order 1050.1E with guidance specific to the implementation of NEPA for the FAA's Office of Airports (ARP), which is responsible for administering the grant-in-aid program and for overseeing planning and development at public-use airports. The Order provides detailed guidance for incorporating NEPA into ARP planning activities and spec-

ifies threshold criteria and the corresponding level of NEPA review for different environmental impact categories. Threshold criteria for water resource categories defined in Order 5050.4B are:

- **Water Quality.** When an action would not meet water quality standards. Difficulty in obtaining a permit or authorization may indicate a significant impact.
- **Wetlands.** When an action would:
  - Adversely affect a wetland's function to protect the quality or quantity of a municipal water supply, including sole source aquifers and a potable water aquifer.
  - Substantially alter the hydrology needed to sustain the affected wetland's values and functions or those of a wetland to which it is connected.
  - Substantially reduce the ability of the affected wetland to retain floodwaters or storm water runoff, thereby threatening public health, safety or welfare. The last term includes cultural, recreational, and scientific public resources or property.
  - Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands.
  - Promote development that causes any of the above impacts.
  - Be inconsistent with applicable state wetland strategies.
- **Floodplains.** When notable adverse impacts on natural and beneficial floodplain values would occur.
- **Coastal Zone Management.** None established (consider consistency with the applicable coastal zone management agency's plan or objections from the coastal zone management agency during coordination).
- **Fish, Wildlife, and Plants.**
  - Federally listed species: When the United States Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) determines a proposed action would likely jeopardize a species' continued existence or destroy or adversely affect a species' critical habitat.
  - Non-listed species: Consider scientific literature on and information from agencies having expertise addressing the affected species. Consider project effects on population dynamics; sustainability; reproduction rates; natural and artificial mortality (aircraft strikes); and the minimum population size needed to maintain the affected population.
- **Wild and Scenic Rivers.** None established.

The FAA *Environmental Desk Reference for Airport Actions* summarizes applicable special purpose laws for convenience and quick reference; the summary helps airports comply with the environmental requirements of special purpose laws applicable to the no action alternative, the proposed action, and reasonable alternatives, and understand how these requirements are integrated into an NEPA document to obtain approval of a proposed action. The Desk Reference provides an introduction of each environmental impact category; laws and regulatory requirements; applicability to airport development actions; permits, certification and approvals; environmental analyses; determining impacts and impact significance; and EIS content. Compared to Appendix A of Order 1050.1E, the Desk Reference provides a more detailed description of water resources issues, significant impacts, and analyses and consultation required.

In accordance with FAA Order 1050.1E, paragraph 405(d)(4), the relevant federal laws and statutes, Executive Orders, and other regulations related to water resources that are typically considered during preparation of a NEPA document are listed in Table C1.

NEPA Compliance Process

Figure C1 presents a general overview of the NEPA process. Typically, airport sponsors, in consultation with the FAA's airport environmental specialist, should identify the appropriate level of environmental documentation required for a project. As shown in the exhibit, an NEPA

Table C1. Laws and statutes, executive orders, and regulations typically considered in the evaluation of water resources under NEPA.

Water Resource Category	Law/Statute, Executive Order, or Other Regulation
All	Federal Laws • NEPA [Public Law (PL) 91-190, 42 United States Code (U.S.C.) 4321-4370(d), effective January 1, 1970, as last amended by PL 94-83]
Water Quality	Federal Laws • Clean Water Act [33 U.S.C. 1251-1387] • Safe Drinking Water Act [PL 104-182] [42 U.S.C. 300f–300j] • Fish and Wildlife Coordination Act [PL 85-624] [16 U.S.C. 661-666c]
	State or Local Laws • State and/or municipal regulations on water quality standards • State storm water management program • State erosion and sediment control law and/or policy • State water protection permit program • Management program applicable to a particular water body
Wetlands	Federal Laws • Clean Water Act, Section 404 [PL 92-500, as amended by PL 95-217 and PL 100-4] [33 U.S.C. 1344] • Rivers and Harbors Act, Section 10 [33 C.F.R. 403]
	United States Department of Transportation Orders • Order 5660.1A: *Preservation of the Nation's Wetlands*
Floodplains	Federal Laws • National Flood Insurance Act [42 U.S.C. 4121]
	Executive Orders • Order 11988, *Floodplain Management* [42 FR 26951, May 24, 1977]
	United States Department of Transportation Orders • Order 5650.2: *Floodplain Management and Protection*
	State or Local Laws • State flood damage reduction act; state, county, and/or municipal floodplain management program or regulations
Coastal Zone Management	Federal Laws • Coastal Barrier Resources Act [PL 97-348] [16 U.S.C. 3501-3510] • Coastal Zone Management Act [PL 92-583] [16 U.S.C. 1451-1464]
	Executive Orders • Order 13089, *Coral Reef Protection* [63 FR 32701, June 16, 1998]
	State or Local Laws • Approved coastal zone management program
Fish, Wildlife, and Plants	Federal Laws • Endangered Species Act [PL 93-205] [16 U.S.C. 1531-1544] • Marine Mammal Protection Action (16 U.S.C. 1361-1421] • Related Essential Fish Habitat Requirements of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act [16 U.S.C. 1855(b)(2)] • Sikes Act Amendments of 1974 [PL 93-452] • Fish and Wildlife Coordination Act [PL 85-624] [16 U.S.C.661-666c] • Fish and Wildlife Conservation Act [PL 96-366] [16 U.S.C. 2901-2912]
Water Resource Category	**Law/Statute, Executive Order, or Other Regulation**
Fish, Wildlife, and Plants	Executive Orders • Order 13112, *Invasive Species* [64 FR 6183, February 8, 1999]
Wild and Scenic Rivers	Federal Laws • Wild and Scenic Rivers Act [PL 90-542, as amended by PL 96-487] [U.S.C. 1271-1287]

Prepared by: Ricondo & Associates, Inc., May 2010 (*1*).

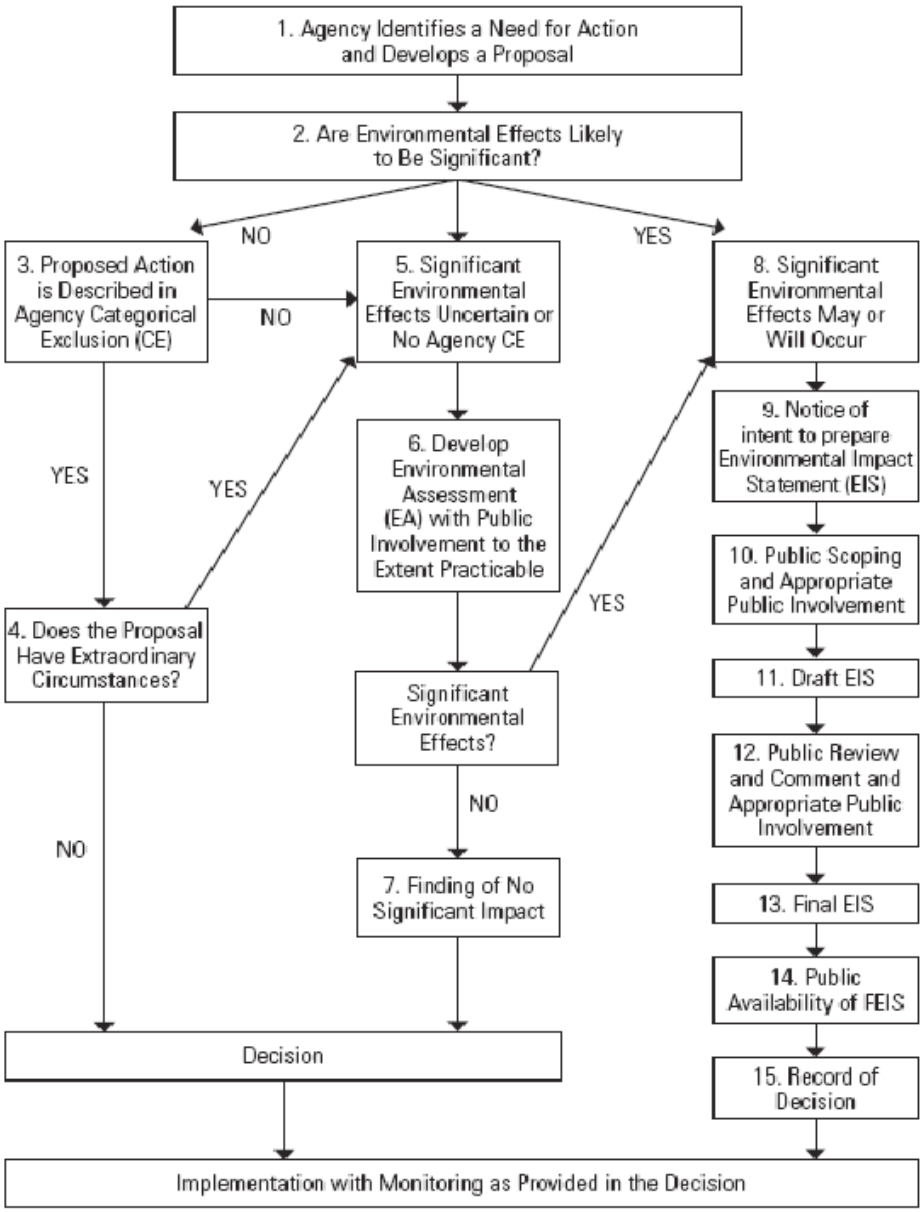

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Figure C1. NEPA process.

review of a project may begin with a CatEx for eligible projects. Based on the findings of the evaluation, a higher level of analysis may be required, leading to the preparation of an EA. Projects that either require preparation of an EIS or that produce significant unavoidable effects are then the subject of an EIS.

The three levels of NEPA review are shown in Table C2 and include actions eligible for a CatEx, actions requiring an EA, and actions requiring an EIS. The graduated levels of analysis required to support the NEPA process from CatEx to EIS are tailored to the anticipated significance of a project, and the resulting documents demonstrate that FAA officials have taken "a hard look" at the environmental impacts a proposed action and its reasonable alternatives. Other agencies, the public, and other interested stakeholders may review the NEPA document to understand the scientific and technical information evaluated by FAA.

Table C2. Three levels of National Environmental Policy Act Review.

Level of Review	Description and Example	Funding Source	Sponsor & FAA Roles	Time to Complete & Comparative Cost
Categorical Exclusion	Most basic level of environmental review for projects that would not have significant effect on the natural or human environment, based on FAA experience with similar actions in the past. Generally applicable to non-controversial projects such as replacement of hangars.	Airport Sponsor	Airport Sponsor Selects Consultant and Leads Analysis; FAA Makes Decision (CatEX)	Function of complexity of environmental review
Environmental Assessment (EA)	Mid-level environmental processing for projects that may significantly affect the natural or human environment. If a significant impact is identified that cannot be mitigated, the FAA would begin the EIS process. Generally applicable to projects that cannot be categorically excluded but would not require EIS such as acquisition of land.	Airport Sponsor	Airport Sponsor Selects Consultant and Leads Analysis; FAA Makes Decision (FONSI or Direction to Prepare an EIS)	
Environmental Impact Statement (EIS)	Highest level of environmental review for projects with known and unavoidable significant impacts despite implementation of mitigation measures. Generally applicable to highly controversial projects such as construction of a new commercial airport.	Airport Sponsor	FAA Selects Consultant and Leads Analysis; FAA Makes Decision (ROD)	

Prepared by: Ricondo & Associates, Inc., August 2006 (*1*, *2*).

The following sections summarize the process typically followed for each level of NEPA documentation.

Categorical Exclusion (CatEx)

A Categorical Exclusion or "CatEx" typically applies to an action, identified by the agency, that does not individually or cumulatively have a significant effect on the environment. FAA guidance lists actions that are typically categorically excluded, which include actions that do not involve extraordinary circumstances. Example projects that are typically categorically excluded include making minor facility renovations or issuing administrative personnel procedures.

In terms of process, the airport sponsor and the FAA environmental specialist will identify whether the action is categorically excluded, and if it is, they will review the action to determine whether any extraordinary circumstances are present. If the action is categorically excluded and does not involve extraordinary circumstances, the FAA can approve the project and make any needed notifications, following which, the airport sponsor may undertake the action. If the action is not categorically excluded or involves extraordinary circumstances, preparation of an EA is usually the next step.

The FAA typically requests information from the sponsor to determine if extraordinary circumstances exist. Expertise required to identify extraordinary circumstances related to water resources depends on the water resource issue under consideration (see the Fact Sheets in Appendix B).

Environmental Assessment (EA)

If the proposed action does not meet the criteria for a CatEx, the airport sponsor and the FAA environmental specialist would collaborate to begin the EA process. If significant impacts are identified through the EA process, an EIS may be required. If no significant impacts are identified, the airport sponsor will prepare the Final EA, the FAA will issue a finding (FONSI), and the sponsor is then able to undertake the action.

Expertise typically required to prepare portions of the EA related to water resource issues depends on the water resource issue under consideration (see the Fact Sheets in Appendix B for applicable water resource categories).

Environmental Impact Statement (EIS)

If the proposed action is anticipated to have a significant impact an EIS is required. According to FAA Order 5050.4B, paragraph 903, projects such as a new airport or new air carrier runway in a metropolitan statistical area or a major runway extension would typically trigger an EIS because of the potential for significant environmental impacts.

Following the identification of need for an EIS, the FAA prepares a Notice of Intent to prepare an EIS for the proposed action and announces an opportunity for other agencies, stakeholders, and the public to participate in scoping to identify potential issues that should be considered in the EIS. Following scoping, the FAA prepares the Draft EIS. Agencies, stakeholders, and the public are provided a period for review and comment, following which the FAA prepares a Final EIS that addresses the comments received during the public review period. The FAA prepares a Notice of Availability of the Final EIS, and then, allowing opportunity for public review of the Final EIS, the FAA prepares the Record of Decision (ROD), which explains the decision maker's rationale for selecting the FAA's preferred alternative and documents any mitigation measures, monitoring, and enforcement actions that may be required. All project documentation, including agency, stakeholder, and public comments received, becomes part of the FAA's official Administrative Record of its decision. As defined in the ROD, the airport sponsor may undertake the action.

Expertise typically required to prepare portions of the EIS related to water resource issues depends on the water resource issue under consideration (see the Fact Sheets in Appendix B for applicable water resource categories).

Coordination with Addressing Water Resource Issues in Project Planning

The NEPA processing of a project may be viewed by airport sponsors as a step that follows project planning. If these planning exercises do not incorporate consideration of water resource issues during the planning and decision making process, there may be a need to revisit the project planning and development of alternatives during NEPA. Some lessons learned from stakeholders on how to best incorporate consideration of water resources issues during planning and during the NEPA process include:

- Often projects and their related regulatory process are unique, so issues such as public controversy can be difficult to anticipate during planning and at the beginning of the NEPA process. Anticipated controversy can require more careful development of the purpose of and need for a project as well as the alternatives that are considered. If potential controversy was not anticipated during planning, the need to strengthen project justification and alternatives can cause delays during the NEPA process.
- Consider the sequencing of NEPA approvals and water resource permitting approvals. Getting permitting approvals before or during NEPA approval could save time and cost by allowing project construction to begin immediately after NEPA approval; however, this could result in the need to revisit the permit application if additional water issues were identified during the subsequent NEPA processing or design.
- Establish relationships with regulatory agencies that manage water resources early in the planning and NEPA process and maintain communication. Early and subsequent coordination

allows regulatory agencies to plan for upcoming workload to help manage the process. Also, for larger programs, such as master plans, regulators can consider comprehensive water resource issues in the permitting process rather than on a piecemeal basis.

- Project proponents should maintain coordination with the FAA (often the lead agency for the airport NEPA process) during coordination with other regulatory agencies to minimize the potential for regulatory delays or conflicts. Furthermore, FAA staff members are knowledgeable in water resource issues and have working relationships with regulatory agencies, which can result in a more efficient process.

References for Appendix C

1. *FAA Order 1050.1E, Chg 1—Environmental Impacts: Policies and Procedures.* FAA, USDOT, March 2006. www.faa.gov/documentLibrary/media/order/energy_orders/1050-1E.pdf.
2. *Environmental Desk Reference for Airport Actions,* Office of Airports, FAA, Oct. 2007. www.faa.gov/airports/environmental/environmental_desk_ref/media/desk_ref.pdf.
3. *FAA Order 5050.4B: National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects.* FAA, USDOT, July 2006. www.faa.gov/airports/resources/publications/orders/environmental_5050_4/media/5050-4B_complete.pdf.
4. *A Citizen's Guide to the NEPA, Having Your Voice Heard.* Council on Environmental Quality, U.S. Executive Office of the President, Dec. 2007. ceq.hss.doe.gov/nepa/Citizens_Guide_Dec07.pdf.

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation