DuPage County Stormwater Management Plan

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Prepared by
DuPage County Stormwater
Management Committee

With
DuPage County
Stormwater Management Division
and CH2M HILL

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The DuPage County Stormwater Management Plan has been established in recognition of the critical need to limit the reoccurrence of extensive flood damages within the county. Development has historically caused increases in flood risk, flood damage, and environmental degradation. The county's Stormwater Management Committee seeks to reverse that trend through the implementation of the Stormwater Management Plan. The Plan responds to the opportunity inherent in State of Illinois legislation P.A. 85-905, which authorizes regional stormwater management in northeastern Illinois counties. It also recognizes the integrated nature of the watershed system and the need to consider stormwater management planning on a watershed basis. The Plan:

- Consolidates the stormwater management framework throughout DuPage County into a united, countywide structure
- Sets minimum countywide standards for flood plain and stormwater management
- Provides for countywide coordination for the management of stormwater runoff in both natural and manmade drainageways and storage

In addition, the Stormwater Management Plan establishes standards for the following Plan components:

- Objectives and Policies
- Watershed Plans and Flood Maps
- Problems and Project Planning
- Maintenance Programs
- Regulatory Programs
- Facility and Local Data
- Technical Guidelines
- Funding
- Implementation and Enforcement

Technical appendices will be developed to establish the minimum criteria by which the achievement of the standards will be judged. When ordinances are adopted, they will establish a legal mandate for implementing the stormwater management standards. Guidelines, such as watershed plans and technical manuals, provide detailed instructions on how the criteria may be achieved and evaluated.

Objectives and Policies

Six primary objectives define the direction of DuPage County stormwater management:

1. Reduce existing potential for stormwater damage to public health, safety, life, and property.
2. Control future increases in stormwater damage within DuPage County and in areas of adjacent counties affected by DuPage County drainage.
3. Protect and enhance the quality, quantity, and availability of surface and groundwater resources.

4. Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.
5. Control sediment and erosion in and from drainageways, developments, and construction sites.
6. Promote equitable, acceptable, and legal stormwater management measures.

Fifteen policies define physical and institutional characteristics of stormwater management.

1. Require appropriate and adequate provision for site runoff control, emphasizing site runoff control wherever the land is developed for human activity.
2. Encourage use of stormwater storage in preference to stormwater conveyance.
3. Require design and evaluation of each site runoff control plan consistent with watershed capacities.
4. Restrict future development in the flood plain to facilities that will not adversely affect flood damage potential or wetland environments, and prohibit development in the floodway unless it involves facilities that enhance flood protection.
5. Require preservation of wetlands to maintain their natural flood control and environmental benefits.
6. Incorporate water quality and habitat protection measures in all stormwater management activities within DuPage County.
7. Require regular, planned maintenance of stormwater management facilities.
8. Encourage control of stormwater quantity and quality at the most site-specific or local level.
9. Define clearly the responsibilities and authorities of government entities having jurisdiction for stormwater or floodwater control within DuPage County.
10. Require cooperation and consistency in stormwater management activities within and between the government entities having stormwater jurisdiction.
11. Promote delegation of authority to the most appropriate jurisdictional level.
12. Require strict compliance and enforcement of the stormwater management policies and their implementing regulations.
13. Foster the use of simple technologies wherever appropriate and realistic, but demand use of more sophisticated techniques where necessary to ensure the adequacy of the storm water controls.
14. Select cost-effective methods of achieving stormwater management objectives.
15. Estimate costs of stormwater management recommendations and identify appropriate revenue sources before their adoption.

These objectives and policies provide the framework for DuPage County stormwater management standards discussed in this plan. They also provide direction for criteria, guideline, and ordinance development.

Watershed Plans and Flood Maps

Major watershed plans will be developed for:

- Salt Creek
- East Branch of the DuPage River
- West Branch of the DuPage River

- Sawmill Creek
- Des Plaines River tributaries
- Fox River tributaries

Watershed plans will include updated and revised flood plain maps; basin-specific ordinances, recommended improvement projects and programs to alleviate present and anticipated flooding problems; identification of wetlands and critical habitats; and identification of groundwater recharge areas.

Standards for watershed plans address:

- Jurisdictional responsibility
- Data collection
- Hydrologic analysis
- Hydraulic analysis
- Flood mapping
- Problem identification
- Water quality enhancements
- Wetland, wildlife, and environment protection
- Alternative analysis
- Public involvement
- Preliminary design

Problems and Project Planning

Stormwater management planning encompasses the recognition of stormwater problems and the identification and evaluation of projects and programs to address those problems. Uniform standards enable effective problem identification, alternative evaluation, project review, and establishment of priorities.

The objectives and policies of the stormwater management plan are best served through active evaluation of existing conditions and anticipation of stormwater and flood control problems before they occur. Agencies must meet minimum countywide standards for reporting, recording, and handling problems. Problems that must follow the policies and procedures of DuPage County include those that:

- Threaten achievement of one or more of the Stormwater Management Plan objectives
- Have impacts beyond the boundaries of the jurisdiction within which the problem originates

Problems are ranked as emergency, critical, serious, incremental, or chronic. Projects proposed to alleviate actual or potential stormwater management problems are evaluated against standards consistent with the goals of the Stormwater Management Plan. The project effectiveness, impacts, and life cycle costs must be evaluated, with preference given to the project alternative that best meets DuPage County's stormwater management objectives.

Maintenance Programs

Stormwater management facilities operate effectively only if they are properly maintained. Regular maintenance prevents system failures and decreases the risk of stormwater damage.

Inspection and maintenance programs must be established for all stormwater facilities. Jurisdictions having responsibility for stormwater facility maintenance must have programs that provide:

- Inspection and preventive maintenance
- Facility repair and replacement
- Recordkeeping
- Emergency response
- Definition of responsibilities

The programs must address the inspection and maintenance of detention structures, drainageways (rivers, streams, and ditches), storm sewers and culverts, inlets and catch basins, and street sweeping. Maintenance activities should be scheduled, with guidelines and procedures established for conducting and setting priorities for activities. Responsibilities should be clearly defined and funding sources specified. Records should be kept in a central location within each jurisdiction, with summaries forwarded to the DuPage County Stormwater Management Committee.

Maintenance neglected by one jurisdiction may affect many others. Provisions must allow jurisdictions to perform maintenance neglected by others at the expense of the responsible party.

Regulatory Programs

Effective implementation of stormwater regulatory programs and permitting requires clear delineation of responsibility and authority. The operational efficiency of the stormwater plan will be enhanced if regulatory programs are delegated wherever possible. Routine regulatory activities should be performed by the jurisdiction most affected by the activity, with the responsibilities of program authorization, program delegation, and program review retained by the delegating authority.

Delegated regulatory programs must be consistent with and at least as stringent as those of the higher delegating authority; the delegating authority has the right to revoke the delegated program if deemed necessary due to a lack of compliance or enforcement. Lower level jurisdictions can enact and enforce regulations more stringent than those of the higher authority.

Specific performance criteria will provide the technical basis for effective regulatory implementation in DuPage County for technical and legal adequacy and be formally incorporated into regulations and ordinances.

Facility and Local Data

Stormwater management decisions require detailed data describing stormwater and flood control facilities and conditions pertinent to the facility site. Data relating to DuPage County stormwater management must be efficiently organized so planners, engineers, and designers can readily obtain existing and updated information.

A summary of currently available stormwater management data within the county will be maintained by the DuPage County Stormwater Management Committee. Updates will be facilitated by municipal and agency transmittals to the Committee summarizing record plans, facilities data, mapping, and time series data as they become available. Digital or reproducible hard copies of stormwater management data shall be provided to the DuPage County Stormwater Management Committee upon request.

Adherence to data collection and reporting guidelines will eliminate costly recompilation of data. Before any field surveys are undertaken, existing data will be examined for suitability. If field surveys are necessary to complete informational requirements, data should be gathered according to technical guidelines.

Technical Requirements

Technical guidelines and criteria are necessary to define procedures and techniques suitable for application in DuPage County. Technical guidelines must provide a clear explanation of factors important to evaluating, planning, and designing stormwater management projects and programs. Guidelines must be supported by criteria that define what is or isn't consistent with the objectives, policies, and standards included in the Plan.

Funding

As new regulations are adopted, watershed plans developed, and stormwater and flood control facilities constructed, new funding requirements for increased construction, operation, and maintenance activities will result. Funding options may be combined to provide flexibility in financing stormwater and flood control related activities. Funding sources are often particularly suited to a specific type of stormwater activity and, while individually unable to provide the total funding needed, work well when used in conjunction with other sources. Funding options to be considered include:

- General fund ad valorem taxes
- Stormwater management property tax
- Special taxing district
- Permit and inspection fees
- Penalties and fines
- Stormwater management utility
- Bond sales
- Homeowners' association
- Impact fees
- State or federal participation

Predictability and equity are important factors to consider in weighing the specific advantages and disadvantages of each funding option. Standards are presented to govern the development, evaluation, and updating of a stormwater management funding plan.

Implementation and Enforcement

The successful implementation and enforcement of the DuPage County Stormwater Management Plan requires:

- Maintenance of close coordination and cooperation with all municipalities and other agencies having stormwater management responsibility in DuPage County
- Periodic review and update of the plan appendices to ensure their currency and completeness
- Continual inspection to identify deviations from the Plan, followed by rapid enforcement action where violations are noted
- Provision of adequate funds to accomplish the implementation and enforcement

The DuPage County Stormwater Management Committee and its staff will provide informational guidance and compliance oversight to enable successful stormwater management in DuPage County.

Glossary

Ad Valorem Tax. Applied in proportion to the value of the taxed item.

Base Flood. A flood having a 1 percent probability of being equaled or exceeded in a given year; also known as the 100-year frequency event.

Energy Dissipator. A device to reduce the energy of flowing water.

Flood Plain. That land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation.

Flood Fringe. That portion of the flood plain outside of the floodway.

Floodway. The channel and that portion of the flood plain adjacent to a stream or watercourse that is needed to store and convey the base flood discharge or the 100-year frequency flood discharge without significant increase in stage due to loss of storage or conveyance or both.

French Drain. A drainage trench backfilled with a coarse, water-transmitting material; may contain a perforated pipe.

Hydraulics. A branch of science that deals with the practical application of the mechanics of water movement.

Hydrograph. A graph showing for a given point on a stream, drainage basin, or a lake the discharge, stage (depth), velocity, or other property of water with respect to time.

Hydrology. The science of the behavior of water in the atmosphere, on the surface of the earth, and underground.

Hydrometeorologic. Water related meteorologic data such as rainfall or runoff.

Infiltration. Passage or movement of water into the soil.

Infiltration Swales. A depressed earthen area that is designed to promote infiltration.

Life Cycle Cost. Cost based on the total cost incurred over the system life including research, development, testing, production, construction, operation, and maintenance. Costs are normally determined on present worth or equivalent annual cost basis.

Manning Roughness Coefficient. A dimensionless coefficient used in the Manning's equation to account for frictional losses in steady uniform flow.

Nonpoint Source Pollution. Pollution that enters a water body from diffused origins on the watershed or drainage basin and does not result from discernible, confined, or discrete conveyances.

100-Year Frequency Flood. A flood having a 1 percent probability of being equaled or exceeded in a given year; also known as the base flood event.

Open Channels. Open channels include not only those which are completely open overhead, but also closed conduits which are flowing partly full. Examples of such closed conduits are tunnels, storm sewers, sanitary sewers, and various types of pipelines. Flow in open channels involves a free surface.

Photogrammetric Techniques. Techniques available in the making of measurements by using aerial photographs.

Regional Stormwater Problem. A problem having a cause or impact that extends beyond the boundaries of the local jurisdiction within which the problem exists, or a problem involving a structure owned by a public entity other than the jurisdiction in which it exists.

Riparian Land. A narrow strip of land that borders a stream or river, and often coincides with the maximum water surface elevation of the 100 year storm.

Runoff. The waters derived from melting snow or rain falling within a tributary drainage basin that exceed the infiltration capacity of the soils of that basin, flow over the surface of the ground, or are collected in channels or conduits.

Scour. The clearing and digging action of flowing water.

Storage. Depressions, basins, or other areas that normally stand empty or partially empty, but fill during storms to hold runoff and reduce downstream flow rates.

Stormwater Management. The practice of controlling precipitation derived runoff to positively reduce damages and maximize use of water resources.

Watershed. The area drained by or contributing water to a stream, lake, or other body of water.

Wetlands. Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

CHAPTER 1

Introduction

Background

In October 1986, the main stem of the Des Plaines River, which flows into northeastern Illinois from Wisconsin, flooded. Communities north of the Chicago area experienced a historic flooding event; many were declared disaster areas. The flood demonstrated to Illinois decisionmakers that water resource management problems were an issue that must be resolved with a more effective system than was in place at the time.

Legislation was drafted that would authorize a planning body for stormwater management in the developing counties encircling the Chicago area. The legislation was introduced into committee for discussion. In August 1987, while the legislation was under review, the tributaries to the Lower Des Plaines were hit by another devastating flood. The second storm accelerated the completion, passage, and signing of the legislation into law. A task force was convened to outline the solution procedure.

DuPage County reformulated its Stormwater Committee in accordance with the terms of the legislation and set aside startup funding to initiate the planning activities as provided within the legislation.

Purpose

The DuPage County Stormwater Management Plan consolidates the existing stormwater management practices, ordinances, and institutional framework from the various government agencies throughout the county into a united, countywide structure; sets minimum countywide standards for stormwater management; and provides for countywide coordination of the management of stormwater runoff in both natural and manmade drainageways and storage facilities.

Authority

The Plan was prepared by the DuPage County Stormwater Management Committee, which was established in accordance with Illinois Public Act 85-905, "An Act to amend certain Acts in relation to stormwater management."

Adoption of the Plan has followed procedures set forth in P.A. 85-905 and includes:

- Coordination with all adjoining counties (Cook, Kane, Kendall, and Will)
- Review by the Northeastern Illinois Planning Commission (NIPC), the Illinois Department of Transportation's Division of Water Resources (IDOT/DWR), and the Illinois Department of Conservation (IDOC)
- Dissemination of information at a Public Meeting held in Wheaton, Illinois, on June 29, 1989
- Public input obtained through a Public Hearing held July 26, 1989, in Wheaton and a subsequent public comment period
- Formal adoption by the DuPage County Stormwater Management Committee by resolution on September 15, 1989.
- Formal adoption by DuPage County Board by resolution on September 26, 1989.

Modifications of this plan following its adoption by the Committee and County Board will have to follow this same adoption process before being formally incorporated into the existing plan.

Implementation

The Plan recognizes the integrated nature of the watershed system and the need to consider stormwater management planning on a watershed basis. The basic hydrologic unit of the Stormwater Management Plan is the watershed. The watershed is a part of a larger environmental system with integrated components delicately balanced over time by the laws of nature. Land use changes influence many of these components, often disturbing that balance to produce unanticipated damage to both the human and natural environments. These damages are often most apparent and severe in the vicinity of the change both upstream and downstream. The cumulative impacts of numerous land use changes can be far reaching and significantly more severe without appropriate stormwater management planning.

The technical standards of the Plan will be implemented through ordinances and agreements formally executed by the governing bodies of DuPage County and the municipalities therein. Model ordinances and specific technical criteria necessary to achieve the standards of the Stormwater Management Plan will be developed in appendixes to this report. Each appendix will comply with the objectives, policies, and standards set forth in the Plan. Drafts of each appendix will be submitted for review to the agencies cited above in the plan adoption procedure. They will be appended to the Plan only after full consideration and formal adoption by resolution of the Committee.

Modifications

The objectives, policies, and standards described in the Plan are expected to remain essentially the same through all subsequent updates of the Plan. Any modifications of the Plan will require formal adoption according to the procedures described above. The appendices, however, are subject to modification independently of the Stormwater Management Plan so that they may be updated periodically as conditions in the county change. They may be modified separately, but only after review by the indicated agencies and formal adoption of the modifications by the Committee.

CHAPTER 2

Objectives and Policies

Introduction

This chapter establishes the meaning and relationships of the classic planning framework of objectives, policies, standards, criteria, and guidelines, and then presents objectives and policies pertinent to stormwater management in DuPage County. Stormwater management standards to achieve county objectives and policies are presented in subsequent chapters of the Plan. Technical criteria by which those standards can be measured are contained in the appendices, and guidelines for evaluating them are provided through reference to external documents (e.g., standard engineering references, technical guidance manuals).

Planning Framework

The stormwater management planning framework consists of five categories:

- **Objectives**, which is the broadest category, sets the overall goals and aims of the Stormwater Management Plan.
- **Policies** establish physical and institutional considerations that affect how objectives are achieved.
- **Standards** present the objectives in qualitative terms that allow individual stormwater management actions to be evaluated and described.
- **Criteria** are quantitative definitions of the standards.
- **Guidelines** are technical discussions that indicate how the criteria may be met and protocols that should be followed.

A planning framework facilitates the orderly development and presentation of planning objectives by enabling resolution of and concurrence on broad issues first. Specific and technical questions are postponed until general agreement is achieved regarding the aims of the Plan. In a more practical vein, such a hierarchy allows formal adoption of the Plan in progressive and constructive segments, allowing the appropriateness and acceptability of each successive planning element to be judged against the background of previously accepted or adopted segments.

The DuPage County Stormwater Management Plan was developed to allow adoption, and potential modification, in the following order:

- The Stormwater Management Plan constitutes the basic document and contains objectives, policies, and standards.
- The technical appendices develop the minimum criteria by which achievement of the standards will be judged.
- The watershed plans evaluate specific watershed conditions and refine criteria to be consistent with adopted standards and watershed needs.
- Adopted ordinances will establish a legal mandate for implementing the stormwater management standards.
- Guidelines, such as watershed plans and technical manuals, will provide detailed instructions on how the criteria may be achieved and evaluated.

Objectives

DuPage County, in cooperation with Lake County and the Northeastern Illinois Planning Commission, developed the enabling legislation that allows regional stormwater management in all northeastern Illinois counties. The plan for DuPage County responds to that enabling legislation.

The DuPage County Stormwater Management Plan recognizes the critical need to reduce the potential for recurrence of flood damage within the county. It also recognizes the need to address the historic trend of increasing flood risk and flood damage as the county develops, and to avoid further environmental degradation associated with drainage development.

The Stormwater Management Plan has defined six objectives to address these needs:

- Reduce the existing potential for stormwater damage to public health, safety, life, and property
- Control future increase in stormwater damage within DuPage County and in areas of adjacent counties affected by DuPage County drainage
- Protect and enhance the quality, quantity, and availability of surface and groundwater resources
- Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas
- Control sediment and erosion in and from drainageways, developments, and construction sites
- Promote equitable, acceptable, and legal measures for stormwater management

Policies

The policies developed to implement the Plan must respond to those specific characteristics that have historically contributed to flooding problems in DuPage County. The following section delineates key characteristics affecting DuPage County stormwater management and presents the policies developed to address them. Figure 2-1 illustrates the relationship between policies and the objectives of the Stormwater Management Plan.

Policies Addressing Physical Characteristics

Site Runoff Control

DuPage County is characterized by low topographical relief, high rainfall, and relatively impervious soils, meaning the county drains poorly in its natural state. Through much of the year the soils are naturally saturated, and surface depressions are filled with water. Such saturated topography conflicts with most human activity. Whether the land is developed for agriculture, residential, commercial, or industrial use, site runoff control is necessary to prevent flood damage in downstream areas.

Traditional site runoff control techniques involving grading and piping to transport stormwater from the site accomplish site drainage only at the expense of downstream drainageways and property owners. Runoff control plans for retaining much of the excess water onsite can be developed, but only for locations where they would minimally interfere with developed land uses. Such plans usually consist of site grading and piping, but may include innovative onsite runoff control techniques (infiltration swales, French drains).

1. **The DuPage County Stormwater Management Plan requires appropriate and adequate provision for site runoff control consistent with watershed plans wherever the land is developed for human activity.**

POLICIES	OBJECTIVES					
	1. Reduce existing potential for stormwater damage to public health, safety, life, and property.	2. Control future increases in stormwater damage within DuPage County and in areas of adjacent counties affected by DuPage County drainage.	3. Protect and enhance the quality, quantity, and availability of surface and groundwater resources.	4. Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.	5. Control sediment and erosion in and from drainageways, developments, and construction sites.	6. Promote equitable, acceptable, and legal stormwater management measures.
PHYSICAL CHARACTERISTICS						
Site Runoff Control						
1. Require appropriate and adequate provision for site runoff control, emphasizing site runoff control wherever the land is developed for human activity.		✓				
Storage						
2. Encourage use of stormwater storage in preference to stormwater conveyance.	✓	✓				
Watershed Focus						
3. Require design and evaluation of each site runoff control plan consistent with watershed capacities.		✓	✓			
Flood Plain Management						
4. Restrict future development in flood plain to facilities that will not adversely affect flood damage potential or wetland environments, and prohibit development in the floodway unless it involves facilities that enhance flood protection.		✓	✓	✓	✓	
Wetland and Environmental Protection						
5. Require preservation of wetlands to maintain their natural flood control and environmental benefits.		✓	✓	✓	✓	
6. Incorporate water quality and habitat protection measures in all stormwater management activities within DuPage County.			✓	✓	✓	
Maintenance						
7. Require regular, planned maintenance of stormwater management facilities.	✓	✓		✓	✓	
INSTITUTIONAL CHARACTERISTICS						
Source Control						
8. Encourage control of stormwater quantity and quality at the most site-specific or local level.	✓		✓	✓	✓	✓
Jurisdictional Definition & Cooperation						
9. Define clearly the responsibilities and authorities of government entities having jurisdiction for stormwater or floodwater control within DuPage County.	✓	✓	✓	✓	✓	✓
10. Require cooperation and consistency in stormwater management activities within and between the government entities having stormwater jurisdiction.	✓	✓	✓	✓	✓	✓
11. Promote delegation of authority to the most appropriate jurisdiction level.	✓	✓				✓
Enforcement						
12. Require strict compliance and enforcement of the stormwater management policies and their implementing regulations.	✓	✓	✓	✓	✓	✓
Appropriate Technology						
13. Foster the use of simple technologies wherever appropriate and realistic, but demand use of more sophisticated techniques where necessary to ensure the adequacy of the stormwater controls.	✓				✓	✓
Cost Effectiveness						
14. Select cost-effective methods of achieving stormwater management objectives.	✓				✓	✓
15. Estimate costs of stormwater management recommendations and identify appropriate revenue sources before their adoption.	✓				✓	✓

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FIGURE 2-1

Relationship Between Objectives and Policies

When implemented, this policy will reduce future onsite flood damage and minimize the effect stormwater may have on human activities.

Storage

Stream and river channels are generally adequate to convey runoff from smaller, frequent storms. Larger, less frequent storms require the flood plains for temporary storage and additional conveyance capacity. In developed areas, frequent storms require historic flood plain areas to accommodate increased runoff rates and to compensate for watershed infiltration and storage capacity lost with development. Runoff from larger storms accordingly extends beyond normal flood plain limits.

Technology enables some improvement in the carrying capacity of drainageways. However, the financial and environmental cost of increasing channel conveyance capacity throughout the county is extremely high. Channel improvements significantly alter both aquatic and riparian environments and potentially increase stream erosion. Furthermore, efforts to increase conveyance capacity within the county would be unproductive if downstream capacity were not similarly increased. The county has only limited ability to affect conveyance beyond its borders, yet it must respond to the state mandate requiring cooperation with neighboring counties for more effective stormwater management. It is recognized that, under some circumstances, increased conveyance is the only feasible stormwater management alternative, but feasible storage is always preferable to conveyance.

2. **The DuPage County Stormwater Management Plan recognizes the inherent advantages of stormwater storage and encourages the use of storage where appropriate in preference to stormwater conveyance.**

When implemented, this policy will:

- Reduce downstream flood damages
- Minimize increases in stormwater runoff rates
- Maintain the adequacy of existing conveyance by not increasing the flows to be conveyed
- Promote stormwater infiltration and evaporation, reducing the volume of runoff
- Maintain the environmental integrity of stream channels by avoiding the need for channel modifications
- Reduce the impact of development on stream erosion rates by limiting peak flows
- Reduce the impact that nonpoint sources of pollution may have on downstream waters

Watershed Focus

Precipitation in DuPage County is usually stored naturally in the soils and surface depressions where it falls. Over time, the natural drainage system of creeks and rivers developed a capacity for conveying stormwater that is balanced with these watershed characteristics. Land development practices offset the natural balance by eliminating the naturally occurring storage, reducing the infiltration of stormwater into the ground, and generally increasing the velocity and quantity of runoff. Receiving streams and rivers do not naturally have capacity for increased flows. Downstream flooding is an expected consequence of land development unless each site runoff control plan is developed with full consideration of downstream capacities and flooding potential.

3. **The DuPage County Stormwater Management Plan requires design and evaluation of each site runoff control plan consistent with watershed capacities.**

When implemented, this policy will reduce offsite and regional flood damages.

Flood Plain Management

Most flood damages occur to development adjacent to the streams in the flood plain or floodway. Construction and development activities in the flood plain frequently disrupt riparian environments.

In the floodway, such activity often increases stream erosion, destroys aquatic habitat, and restricts flood flows, thus increasing the depth of upstream flooding. Flood plain and floodway development decreases natural overbank storage, thereby increasing peak flows in downstream areas.

However, some uses of the flood plain are necessary and desirable for the human and natural environment. Essential urban utilities, such as major arterial roadways and sanitary trunk sewers, must necessarily traverse flood plains and floodways. In such instances, mitigating measures can be employed to offset impacts. Other uses such as public recreation facilities or natural areas may be neutral to flood plain conveyance and storage or, in the case of mitigating wetlands, may enhance storage. While it is desirable to restrict or control the type of development that occurs in the flood plain, it is neither desirable nor necessary to prohibit all types of development.

4. **The DuPage County Stormwater Management Plan will restrict future development in the flood plain to facilities that will not adversely affect flood damage potential or wetland environments. Within the floodway, development will be prohibited unless it involves facilities that enhance flood protection.**

When implemented, this policy will reduce future flood damage and maintain the integrity of stream channels.

Wetland Protection

Wetlands are a significant portion of the natural watershed storage in DuPage County. Natural watershed storage has played an important role in determining the conveyance capacity of existing drainageways. By filling wetlands, the storage volume is lost and downstream reaches flood to maintain the natural watershed balance. Wetlands also promote infiltration, which reduces runoff volume and recharges groundwater supplies. They retain the pollutants contained in runoff to protect water quality, and they provide habitat for numerous species.

5. **The DuPage County Stormwater Management Plan requires preservation of wetlands to maintain their natural flood control and environmental benefits.**

When implemented, this policy will protect the natural watershed storage capacities, maintaining the integrity of existing drainageways and provide water quality and habitat protection.

Environmental Protection

Certain environmental protection measures complement good stormwater management. For example, effective erosion control is a significant nonpoint source pollution control and aquatic habitat protection measure. It is also effective in preventing excessive channel obstruction due to sedimentation. Maintaining natural stream channel cross section and alignment is important in promoting a healthy aquatic environment. It is also important to maintain the natural storage capacity and conveyance characteristics of the channel.

6. **The DuPage County Stormwater Management Plan will incorporate water quality and habitat protection measures in all stormwater management activities within DuPage County.**

Programmed Maintenance

Many existing stormwater management facilities in DuPage County function far below their potential. Culverts and drains are often choked with vegetation, debris, or sediment. Detention basins have lost capacity because of sediment buildup. Some structures have collapsed and no longer control runoff as desired. Furthermore, debris in the drainageways often leaches pollutants into the waterways.

7. **The DuPage County Stormwater Management Plan requires regular, planned maintenance of stormwater management facilities.**

When implemented, this policy will reduce flood damage and maintain the integrity of stream channels.

Policies Addressing Institutional Characteristics

Source Control

Onsite mismanagement of stormwater can exacerbate problems as the stormwater moves downstream. Problems are usually least severe and most readily controlled by structural means near the source of the runoff. This is also the case for stormwater quality concerns. If the stormwater and the pollutants it carries are controlled near their origin, then the area affected is reduced. Often source control of stormwater is more effective and less costly than downstream stormwater management.

8. **The DuPage County Stormwater Management Plan encourages control of stormwater quantity and quality at the most site-specific or local level as possible, but only where long-term maintenance is fully provided.**

When implemented, this policy will reduce flood damage and erosion from development, prevent nonpoint pollution, and minimize runoff pollution.

Jurisdictional Definition

Numerous entities, from individual developers through municipalities, county departments, and state and federal agencies, have responsibility and authority to control parts of stormwater and floodwater within DuPage County. Thus it is difficult to determine where responsibility lies, and often action is not taken on critical stormwater issues (e.g., channel maintenance).

9. **The DuPage County Stormwater Management Plan will provide clear identification of responsibilities and authorities delegated to the various agencies having jurisdiction for stormwater or floodwater control within DuPage County.**

When implemented, this policy encourages implementation of all other policies to achieve all plan objectives.

Jurisdictional Cooperation

Since stormwater recognizes no jurisdictional boundaries, management activities within any jurisdiction necessarily affect other jurisdictions in the same watershed. Inconsistencies in stormwater management standards or criteria could readily result in increased flood damage.

10. **The DuPage County Stormwater Management Plan requires cooperation and consistency in stormwater management activities within and between agencies having stormwater jurisdiction.**

The operational efficiency of the plan will be enhanced if regulatory programs are delegated to the local level.

There are often very good reasons for more stringent controls in localized areas where additional protection is needed or desired. Strong stormwater management programs exist in many jurisdictions. These programs are effective in resolving local jurisdictional stormwater management problems and are sensitive to other local issues. The strength of these programs is recognized and is considered to be an important element in the DuPage County Stormwater Management Plan.

11. **The DuPage County Stormwater Management Plan promotes delegation of authority to the most appropriate jurisdictional level.**

When implemented, these policies will reduce flood damage potential while encouraging implementation of all other policies to achieve all plan objectives.

Enforcement

Stormwater management policies and regulations can only be effective if they are implemented routinely and consistently. Since implementation must take place at many locations over long periods of time, enforcement of the regulations is difficult and often overlooked in favor of more immediate issues. Inconsistent enforcement of stormwater regulations limits their implementation and contributes substantially to the continued growth of the extent and severity of flood damage.

12. The DuPage County Stormwater Management Plan requires strict compliance and enforcement of the stormwater management policies and their implementing regulations.

When implemented, this policy will reduce opportunities to circumvent the plan and help achieve all objectives.

Appropriate Technology

The technology available to support stormwater management ranges from the simple to the complex. Simple techniques are more likely to be employed since they are widely used and easily applied. Simple technologies are often easier and less costly to maintain, but they can leave little flexibility for dealing with unusual or complex realities. Applying simple techniques can result in inappropriate and ineffective management if the problems are more complex than the solutions used. Conversely, sophisticated solutions can postpone action and increase the cost of stormwater management.

13. The DuPage County Stormwater Management Plan allows simple technologies wherever appropriate and realistic, but demands use of more sophisticated techniques where necessary to ensure the adequacy of stormwater controls.

When implemented, this policy encourages use of appropriate technology, thereby reducing the risk of inappropriate stormwater management activities. This in turn will enhance the effectiveness of the stormwater management activities undertaken to achieve Plan objectives.

Cost-Effectiveness

The cost of stormwater management projects must be justified in terms of the flood damages or environmental harm avoided. Concentrating resources on cost-effective stormwater management activities allows implementation of more controls within a limited budget. Cost-effectiveness may be judged only by definitions consistent with all stormwater management objectives, and hence must include life cycle costs, environmental costs, and both local and regional effects.

14. The DuPage County Stormwater Management Plan encourages cost-effective methods of achieving stormwater management objectives.

When implemented, this policy will reduce overall costs, allow funding of more facets of the Plan, and increase the Plan's effectiveness in achieving all goals.

Fiscal Responsibility

Recommendations of the Stormwater Management Plan will be carried out only if their costs are clearly established and understood, and a source of revenue to offset those costs is available.

15. The DuPage County Stormwater Management Plan requires the estimation of costs of stormwater management recommendations and identification of appropriate revenue sources before their adoption.

When implemented, this policy enhances the credibility and acceptability of the Plan, thereby encouraging its implementation and the achievement of all its objectives.

CHAPTER 3

Watershed Plans and Flood Maps

Introduction

Salt Creek, East Branch DuPage River, West Branch DuPage River, and Sawmill Creek (see Figure 3-1) will have major watershed plans. Cooperative plans will be developed with adjacent jurisdictions for Des Plaines River tributaries and Fox River tributaries. This chapter identifies the standard components of a watershed plan. Standards are given for:

- Jurisdictional responsibilities
- Data collection
- Hydrologic analysis
- Hydraulic analysis
- Flood mapping
- Problem identification
- Alternative analyses
- Economic analysis
- Water quality enhancements
- Wetland, wildlife, and environment protection
- Public involvement

Watershed plans will include:

- Updated and revised flood plain maps
- Recommended remedial improvement projects, both structural and nonstructural, to alleviate current and anticipated flooding problems
- Identification of natural storage areas, including wetlands
- Identification of significant natural areas
- Identification of groundwater recharge areas within the watersheds
- Recommended site runoff and watershed storage criteria balanced with the watershed capacities
- Flood forecasting recommendation
- Other

Jurisdictional Responsibilities

Jurisdictional responsibilities must be identified and assigned in accordance with the established regulatory and maintenance program standards discussed elsewhere in this document.

Each watershed plan will document the regulatory authority and maintenance responsibility for each component of the stormwater management facilities within the watershed.

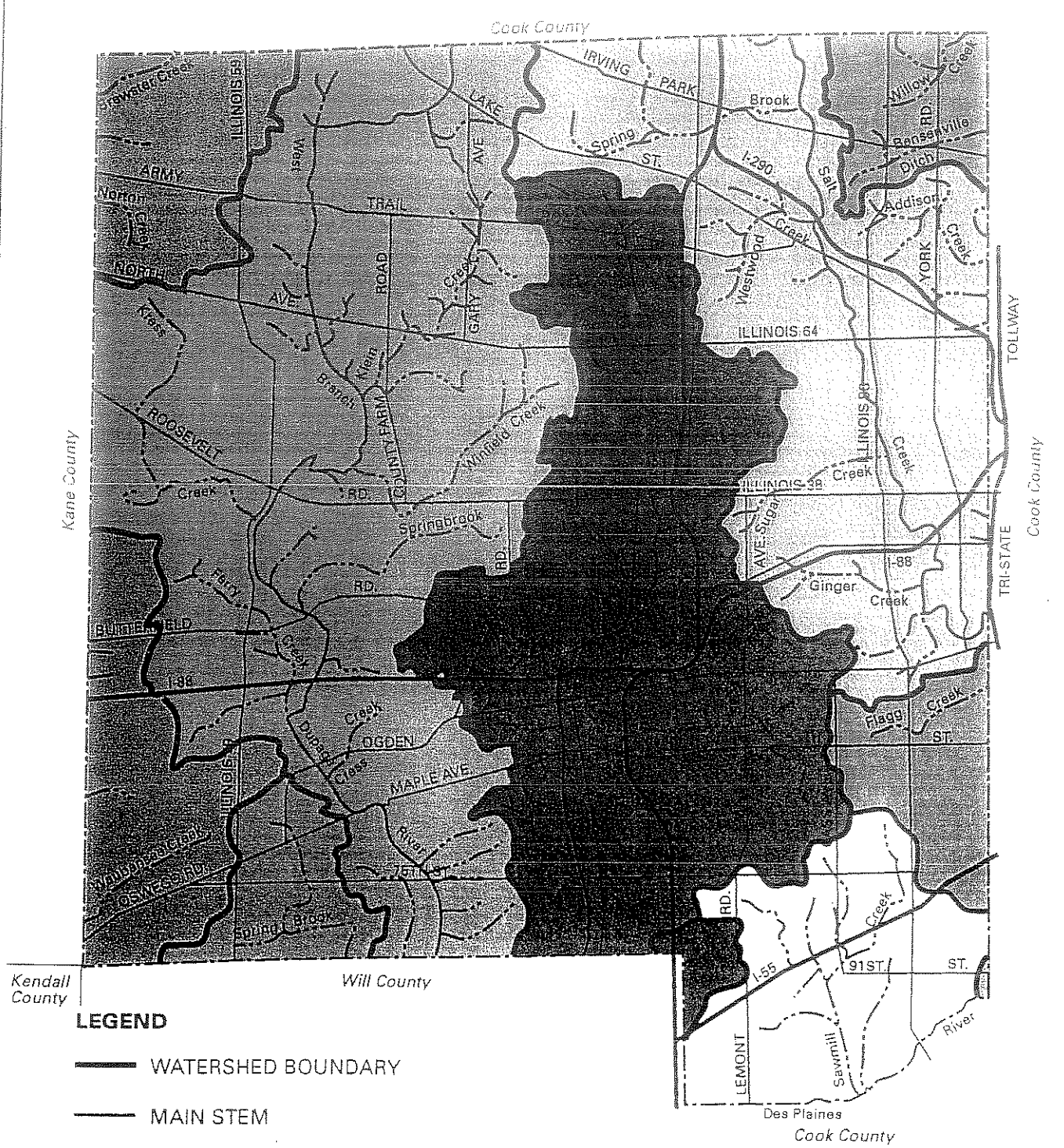

FIGURE 3-1
DuPage County Watersheds

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Data Collection

Detailed data must be collected for the protection of water quality and aquatic and riparian habitat, for accurately delineating flood plains, and for identifying flooding problems and maintenance needs. Data must be collected in accordance with the established facility and local data standards and maintenance program standards.

All existing data sources should be exhausted before undertaking new data collection or land use/population projection efforts.

Each watershed plan will include the data required to complete a detailed analysis of the hydrology and hydraulics of the watershed and all major tributary watersheds using a continuous hydrology model and a fully dynamic runoff and flood routing model.

Each watershed plan will include a schedule of inspections and monitoring necessary to identify existing stormwater management facilities that are not performing their intended function or are below capacity.

Each watershed plan will map natural storage areas including wetlands, significant aquatic and riparian environments, and groundwater recharge areas.

Hydrologic Analysis

The results of the hydrologic analysis will be coupled with those of the flood and runoff routing model to establish the regulatory flood plain within the watershed. Because of the low topographic relief, impervious soils, and changing land use within much of DuPage County, there are stringent requirements for analysis of watershed hydrology.

Hydrology for the four major watershed plans will be determined by a continuous hydrologic model that considers, at a minimum, infiltration, interflow, depressional storage, snowmelt, overland flow, nonuniform rainfall distribution, evapotranspiration, soil moisture, and changing land use. The output from the hydrologic model must be compatible with the hydraulic model.

Hydrologic analyses for the cooperative plans to be prepared for the Des Plaines and Fox River tributaries must be technically realistic in their representation of the headwaters in DuPage County. Beyond that, standards for their selection must be jointly developed with the adjacent governmental units cooperating in their development.

Hydraulic Analysis

The results of the hydraulic analysis will be used to establish the regulatory flood plain within the watershed. Because of the flat stream gradients within DuPage County and the need to evaluate the effects of flood plain encroachment and proposed stormwater management projects, a fully dynamic runoff and flood routing model is needed.

Hydraulics for the four major watershed plans will be determined by a fully dynamic runoff and flood routing model that can, at a minimum, analyze the effects of flood plain encroachment, online and offline storage, diversions, channel improvements, bridges, culverts, dams, weirs, and other impediments to flow. The input to the hydraulic model will be compatible with the output from the hydrologic model.

For the cooperative plans to be developed in basins tributary to other counties, the hydraulic analysis standards must be jointly defined with the cooperating government unit.

Flood Mapping

Up-to-date flood plain maps are important components of a watershed plan. Accurate information on flood plain location and flood levels is necessary to reduce flood damage to public health, safety, life, and property.

The developers of each watershed plan will work with IDOT/DWR and FEMA to update and possibly to revise existing flood plain maps within the watershed with the most reliable and accurate technology.

Problem Identification

As part of the effort to enhance water quality and aquatic and riparian environments and to reduce flood damage, problem areas must be identified.

Each watershed plan will use the inventory summary (Appendix C), the runoff and flood routing analysis, and any other available information to identify existing and potential flood damage areas (i.e., areas with an incompatible flood risk and land use combination). An estimate of the expected annual damage to property for each problem area will be developed.

Each watershed plan will identify areas where flood plain encroachment could significantly harm wildlife or aquatic or riparian environments.

Each watershed plan will identify areas where stormwater runoff degrades water quality to the point of harming aquatic and riparian environments.

Water Quality Enhancements

Projects, policies, and regulations that maintain or improve water quality will be formulated in accordance with Appendix J, "Water Quality Enhancements."

Each watershed plan will identify projects, policies, and regulations that will enhance water quality. The cost of any project, or secondary effects of any policy or regulation, will be tabulated along with the expected water quality benefit.

Protection of Wetlands, Riparian Environment, and Recharge Areas

Criteria for protection of wetlands, riparian environment, and recharge areas will be formulated in accordance with Appendix K, "Wetland and Riparian Environment Protection."

Each watershed plan will identify remedial measures to protect wetlands, riparian environment, and recharge areas threatened by stormwater management activities. Measures identified will be coordinated with county and municipal open-space acquisition programs for the identification of land with mutual benefits. The cost of any remedial measures will be tabulated along with the expected benefits.

Alternative Analysis

To reduce overall costs of stormwater management, it is important to develop and analyze different alternatives to solve an identified problem. This may allow funding of more facets of the watershed plan and increase its total effectiveness.

Each watershed plan will analyze several alternatives, including inaction, to address each identified problem or group of problems and develop a list of recommended

solutions. Benefits will be weighed against costs and any potential harm to water quality, aquatic or riparian environments, or recharge areas. All policies of the DuPage County Stormwater Management Plan will be considered in selecting the recommended alternative.

Economic Analysis

Economic analysis for watershed plan alternatives should recognize the full range of life cycle costs and benefits.

Project benefits will include all quantifiable monetary savings, including reduction of local and regional flood damages, as well as nonquantifiable environmental benefits.

Monetary costs should include, at a minimum, land rights, design, construction, interest, operation, maintenance, and administration. Economic benefit analyses must consider the probability and present worth of damages avoided.

Public Involvement

Public participation is a critical and necessary element in the adoption of any master plan. It is useful not only to ease the adoption of the plan but also to gather useful information and to assist in the decisionmaking process.

As part of each watershed plan, a public education and information program will be developed to inform the public of the planning efforts and to obtain public input and comment. The program will include public meetings, meetings with elected officials or their representatives, and the publication and distribution of fact sheets.

Watershed advisory committees may provide a vehicle for information exchange in the four major watersheds.

CHAPTER 4

Problems and Project Planning

Introduction

This chapter provides standards for recognizing problems that require stormwater management planning and for identifying and evaluating alternative projects to address those problems. Various phases of stormwater management problem remediation are addressed:

- Problem identification
- Alternative evaluation
- Project review
- Establishment of priorities

Consistency and equity in addressing problems and projects throughout the county will be achieved through application of the uniform standards set forth in this chapter.

Problem Identification

A stormwater management problem is defined as any inconsistency with the objectives of the Stormwater Management Plan. Problem identification involves several steps:

- Observation
- Reporting
- Investigation and evaluation

Observation

Stormwater problem observation may be either active (watershed model predicting future damages, inspection crews projecting future flooding if obstructions are not removed, etc.) or reactive (residents' complaints, flood damages, etc.). Reactive observations do not necessarily indicate the presence of a stormwater management problem. For example, sanitary sewerage system backups are often reported as stormwater problems.

The objectives and policies of the Stormwater Management Plan are best served through active observation, which allows evaluation and prevention of problems before they occur. Active observation requires that the persons responsible for the various aspects of stormwater management (planning, engineering analysis, inspection, construction, maintenance) be sufficiently trained in stormwater management to recognize potential problems.

Delegation of stormwater management responsibility within the county (e.g., ordinance, intergovernmental agreement, contract) must provide that the responsible party has sufficient stormwater management training and resources to enable recognition of potential problems.

Reporting

Anyone observing a stormwater management problem should easily be able to report it to a responsible agency so that appropriate action can be taken. Since it is unrealistic to expect all

potential observers of stormwater problems to understand the various levels and responsibilities of stormwater management within the county, it is necessary to have a well defined structure and procedure for reporting, recording, and handling problems.

The DuPage County Stormwater Management Committee has primary responsibility for coordinating overall stormwater management activity within the county. The responsibility for problems beyond local jurisdiction lies with the committee.

The Stormwater Management Committee will maintain staff and facilities to receive and record stormwater management complaints and problem observations received through local jurisdictions.

Rather than duplicating resident response facilities, initial complaint and problem observation will remain the responsibility of the municipality where the complaint or observation originates.

Investigation and Evaluation

Problem investigation and evaluation begins by determining whether a stormwater management problem truly exists. Some stormwater management problems will be of local interest only and need not be addressed by countywide policies and procedures. For a problem to be of concern to the Stormwater Management Committee:

- It must threaten achievement of one or more of the plan objectives; i.e., it must:
  - Contribute to flood damage to public health, safety, life, or property
  - Cause future increases in flood damages
  - Potentially degrade the quality or affect the quantity of surface water
  - Cause significant damage to aquatic or riparian environments
  - Contribute to soil erosion or drainageway sedimentation
- It must have a cause or impact that extends beyond the boundaries of the local jurisdiction within which the problem exists or involve a structure owned by a public entity other than the jurisdiction in which it originates.

If a problem is determined to be a local problem, then it is the responsibility of the municipality to apply local policies and standards to resolve the problem.

If the problem is determined to be a regional stormwater management problem, then it must be evaluated in accordance with the standards of the countywide Stormwater Management Plan. Several categories of problem severity are defined:

- **Emergency** - There is immediate danger to public health, safety, life, or property.
- **Critical** - If the problem remains unsolved, public health, safety, life, or property will be at risk during a major storm, or water quality, environments, or groundwater recharge areas will suffer irreparable damage.
- **Serious** - Major damage to water quality, environments, recharge areas, or drainageways will result if the problem remains unsolved.
- **Incremental** - The problem itself results in only minor inconsistencies with the Stormwater Management Plan objectives, but if combined with other similar problems could pose a serious threat.
- **Chronic** - The problem continually or frequently results in minor deviations from the Stormwater Management Plan objectives.

To assist in the evaluation of the nature and severity of a problem, the Stormwater Management Committee will periodically review and update technical guidance and criteria for evaluation of stormwater management problems.

Primary responsibility for evaluating complaints and problems will lie with the Stormwater Management Committee staff. Delegation of that responsibility will be allowed only when clearly documented and formally agreed to by both the staff and the delegate.

Alternative Evaluation

All projects proposed to alleviate actual or potential stormwater management problems must be evaluated against a set of standards consistent with the objectives and policies of the Stormwater Management Plan. Documentation must be provided with all stormwater management projects submitted for countywide Stormwater Management Committee support showing that:

- A need for the project exists.
- Project alternatives were adequately considered, and technically feasible alternatives have been evaluated against the standards cited here.
- Project effectiveness in alleviating the problem was demonstrated with techniques appropriate to the problem and consistent with the current technical guidance.
- Project impacts beyond the project site (upstream and downstream) were thoroughly investigated with methods consistent with the current technical guidance.
- The project will be consistent with the applicable watershed plan.
- Project life-cycle costs were estimated with appropriate techniques, consistent with current technical guidance, and include land rights, construction, operation, and maintenance costs.
- Project impacts on the full aquatic regime, including stormwater control, low flow frequency and velocity, water quality, groundwater, aquatic and riparian environmental mitigation, and stream erosion and stability were fully evaluated and considered in the project evaluation.
- The alternative comparison gave preference to alternatives that would best meet the policies and objectives of the Stormwater Management Plan.
- The evaluation considered all factors used in establishing project priorities for countywide Stormwater Management Plan implementation.

Each agency submitting a project for consideration by the Stormwater Management Committee is responsible for full documentation of the alternative evaluation consistent with the plan and the technical guidance. The agency may request the assistance of the Stormwater Management Committee staff in preparing the alternative evaluation, and the committee will evaluate such requests in light of the current staff time availability, severity of the problems addressed, and regional significance of the project.

Project Review

Any development, stormwater, or construction project submitted for permit review or funding consideration within DuPage County must be evaluated against standards consistent with the objectives and policies of the Stormwater Management Plan. Minimum standards for project review are summarized in Table 4-1. Criteria for evaluating compliance with these standards will be periodically reviewed and updated by the Stormwater Management Committee.

Establishing Priorities

Stormwater management project alternatives that meet the standards and criteria for countywide stormwater consideration will be funded on a priority basis as funding is available. The priorities for project funding will be reviewed regularly when the county budgets are being established.

Considerations in establishing project priorities will include:

- Regional effectiveness
- Historical significance of problems addressed

- Consistency with watershed plans
- Consistency with all stormwater management objectives
- Cost-effectiveness
- Implementation time
- Effect on risk to human health, safety, or inconvenience

The Stormwater Management Committee will periodically review and update technical guidance and criteria for applying these standards to establish project priorities.

Table 4-1 Project Review

Policy Synopsis	Related Standard
Encourage site runoff control emphasizing onsite detention or retention.	Adequate site runoff control, consistent with current technical guidance, has been provided. Evaluation of onsite control alternatives in developing as well as developed areas has been conducted, and offsite control alternatives have been recommended only if significantly superior to onsite alternatives.
Encourage stormwater storage, where appropriate, in preference to conveyance.	Evaluation of storage alternatives has been conducted, and conveyance alternatives have been recommended only if superior to storage alternatives.
Evaluate site runoff control plans consistent with watershed capacities.	Project runoff release rates are consistent with those recommended in the applicable watershed plan. If a watershed plan is not available, project release rates are less than predevelopment storm runoff rates and consistent with current technical guidance.
Restrict flood plain developments to those that do not adversely affect flood damage potential or wetland habitats, and in the floodway allow only developments that enhance flood protection.	All projects must be identified as either beyond the flood plain, in the flood plain but beyond the floodway, or within the floodway. If the development is within the flood plain but beyond the floodway, it must not be permitted unless it has been thoroughly evaluated, is consistent with current technical guidance, and has been demonstrated to be protected against flood damage and have no adverse flood, wetland, or habitat impact upstream, within, or downstream of the project site. If the development is within the floodway, it must not be permitted unless its major purpose is the enhancement of flood protection and it meets the criteria stated above for development in the flood plain.
Require regular, planned maintenance.	Projects must include maintenance plans, including statement of responsibility, consistent with the technical guidance for maintenance of the facilities included. All projects' specifications must include requirements for installing and maintaining construction erosion control practices consistent with technical guidance.
Encourage control of water quantity and quality at the source.	All projects must include evaluations and recommendations for minimizing pollutant runoff from the site.
Foster the use of appropriate and practical technology.	Project evaluation technology must be consistent with technical guidance and applied to the project by a qualified professional.
Encourage fiscal responsibility.	Project documentation must include a funding plan consistent with technical guidance.

CHAPTER 5

Maintenance Programs

Introduction

Stormwater and flood control facilities operate effectively only if they are properly maintained. Regular maintenance prevents system failures and decreases the risk of stormwater damage.

Inspection and maintenance programs must be established for all stormwater facilities. All jurisdictions having responsibility for stormwater facility maintenance must have programs that provide:

- Inspection and preventive maintenance
- Facility repair and replacement
- Recordkeeping
- Emergency response
- Determination of responsibilities
- Suitably trained and sufficiently available staff

Programs must address the inspection and maintenance of:

- Detention structures
- Drainageways (rivers, streams, and ditches)
- Storm sewers and culverts
- Inlets and catch basins
- Streets (sweeping)
- Retention structures
- Reservoirs
- Wetlands constructed to provide storage

Responsibilities and jurisdictions must be clearly outlined and consistent. Delegations of responsibility must include provisions for the delegating agency to enforce maintenance agreements and perform neglected maintenance at the expense of the delegate if the delegate fails to comply with current maintenance guidelines.

Inspection and Preventive Maintenance

The purpose of an inspection and preventive maintenance program is to identify and remedy potential problems before they can cause damage. The cost of a successful program may be less than costs incurred in responding to major system failures.

Inspection and maintenance programs must be required by ordinance and by covenant if assigned to a third party. For each stormwater or flood control facility, the program must specify:

- A regular inspection and maintenance schedule
- Guidelines and procedures for conducting inspection and maintenance

- Procedures to be followed for reporting, scheduling, and performing extensive maintenance
- The government entity responsible for inspection and maintenance
- Dedicated funding sources for the inspection and maintenance program

Table 5-1 lists minimum requirements of a typical inspection and preventive maintenance program for each type of stormwater or flood control facility. These requirements are discussed below. Specific details of the maintenance program for each facility component are included in Appendix I.

Detention Basin

The integrity of the detention basin depends on the proper maintenance of the retaining structure, outlet, and basin. Preventive maintenance is required to keep the outlet operational at all times. The basin should be maintained to operate at its intended storage capacity. Underground detention tanks should be inspected and maintained as indicated for storm sewers. If appropriate, inspection of detention basins shall be consistent with the Illinois dam safety program. Inspections at the end of the flood season shall identify major repairs to be completed before the next season. Wetlands constructed as mitigation or water quality projects will need special maintenance if they are to function as intended.

Table 5-1 Facilities Requiring Regularly Scheduled Inspection and Maintenance

Detention Basins	Storm Sewers and Culverts	Inlets and Catch Basins	Streams	Streets
Outlet	**Storm Sewers**	Remove debris	Visually inspect entire length	Sweep roads
Remove debris	Inspect storm sewers	Check for signs of failure	Remove debris	Sweep Parking lots
Inspect for signs of outlet failure	**Culverts**		Remove log jams	Monitor sediment and debris sources
Pumps -Test -Maintain	Remove debris		Monitor sedimentation	
Basin	Update maps/ plans		Check that only authorized structures are in flood plain	
Remove Debris	Inspect for signs of deterioration		**Long-Term Plan**	
Inspect for signs of basin failure			Update list of maintenance actions required	
Monitor sedimentation			Update emergency response plan	
Check that flood plain/ floodway and spillway are clear				
Dam/retaining structure				
Underground Detention Tanks				
Inspect				

Construction Erosion

Strict enforcement of sediment control ordinances is an important cost-saving step toward solving sedimentation problems. Since sediment in the stormwater and flood control system poses a maintenance problem, inspection and maintenance must be performed routinely to identify and control major sediment contributors. Excessive sedimentation decreases detention basin capacity, retards infiltration, and clogs streams. Major storms resuspend sediments collected on basin floors and compromise water quality both in and downstream of the basin. Dredging in wet basins, wetlands, or streams destroys habitat, creates water quality problems, and is very costly.

Drainageways

Staff who inspect and maintain drainageways should periodically walk along the entire length of the river, stream, or ditch. Debris, trash, log jams, or jams caused by debris or trash that would affect flooding must be removed.

Bank erosion should be reported but not necessarily repaired. Certain bank and channel bottom conditions are an attractive environment for many animal species. Its destruction and the decrease in water quality must be considered before any decision is made to dredge the drainageway. Habitat is usually not a concern for the dredging and cleaning of paved channels, but if the drainageway is wet at the time of dredging, downstream water quality is a concern. Certain maintenance activities may require state and federal permits.

The flood plain and floodway should be inspected to ensure that no unauthorized structures have been built. Inadequate or poorly maintained floodproofing must be recorded and the owners notified to undertake corrective action.

Storm Sewers and Culverts

All storm sewers should be inspected periodically. Television monitoring (or physical inspection if over 48 inches in diameter) should check for cracks, deterioration, or structural failure.

Storm sewer manholes must be maintained to provide ready access for necessary repairs.

Culverts should be kept clear of debris and structures should be inspected for cracks, deterioration, or structural failure (sometimes indicated by erosion and cave-ins caused by seepage). Excessive erosion around the culvert inlet and outlet will reduce the structural support and lead to failure.

Inlets and Catch Basins

Debris and trash should be cleared from all inlets and catch basins periodically. More frequent cleaning may be warranted in the autumn when leaves are falling. Excessive sediment and debris sources must be identified and recorded, with maintenance performed at the expense of the responsible party.

Inspect the inlet and catch basin structure for cracking or structural failure. All pipes leading to and from the inlet or catch basin must be operational and not clogged with debris. Problem inlets and catch basins should be more frequently cleaned and maintained.

Street Sweeping

Street sweeping enhances the maintenance of stormwater and flood control facilities. Sweeping prevents the need to remove sediments and debris from detention basin outlets, drainageways, storm sewers, culverts, inlets, or catch basins. In addition, pollutants that attach to the sediments are captured and removed before they can compromise water quality.

Streets should be swept more frequently in the spring and following snowmelt to capture the salt and sand spread on icy roads. Streets should be swept more often in the autumn, particularly in areas with mature, leafy trees. Parking lots should also be swept regularly.

Facility Repairs and Replacements

Each jurisdiction responsible for stormwater facility maintenance must maintain an active facility repair and replacement schedule. Updates should be made to the schedule after each scheduled inspection and maintenance trip.

The sequence of repairs and replacements should be consistent with the stormwater management objectives and be determined in accordance with criteria similar to those for establishing the priorities of stormwater construction projects.

The County Stormwater Management Committee will selectively acquire equipment necessary for the maintenance of major stormwater facilities. This equipment will be available to other jurisdictions within the county when not required to meet county stormwater maintenance responsibilities.

During each inspection and maintenance trip, the status of repairs and replacements should be observed and recorded. Neglected repairs, replacements, and general maintenance should be brought to the attention of the responsible jurisdiction.

Recordkeeping

Updated records must be kept of:

- Scheduled inspection and maintenance notes
- Maintenance history
- Lists of required repairs and repair dates
- Lists of required replacements and replacement dates
- Major contributors of debris and sediment, warnings, and maintenance billings

Records must be kept in a central file within either the municipal engineering or public works departments (or similar group) but not both, unless a duplicate file or common computer network is shared. Summaries of available records should be forwarded to the county annually. Record drawings of repairs or changes in the stormwater facilities should be promptly forwarded to the county. Records must include:

- Date (time if appropriate)
- Person reporting, other persons involved
- Description of type of problem, repair, replacement, map, visit, etc.
- Location and address
- Action required, if any
- Date action is to be complete, if applicable
- Quality control check initialed by municipal engineer, public works director, or other responsible party

Emergency Response

Stormwater emergency response action plans must be incorporated in each municipal emergency preparedness program. The emergency response procedures will be coordinated with the County Emergency Response and Disaster Agency. A review of the inspection and maintenance reports, repair and replacement lists, and complaint records must be made for each stormwater and flood control facility within the municipality before the approval or updating of the emergency response action plan. A public meeting or notice is required to announce emergency response actions and describe the policy for problem reporting.

The emergency response action plan should include:

- Name of person responsible for overseeing the emergency response action
- Steps to be taken to inform residents or businesses
- Information to be given to residents or businesses
- Action guidelines (what to do, who should do it, how to do it, in what order)

Responsibilities and Jurisdictions

The primary responsibility for maintenance lies with the municipality in which the stormwater or flood control facility is located; e.g., city, village, county (for unincorporated areas), Forest Preserve District (for forest preserve areas). Coordination of maintenance activities must be centralized by a single manager who will delegate responsibilities to the appropriate agencies and persons.

Delegated Responsibilities

Municipalities may delegate responsibility to subdivision or homeowners' organizations (or like) only if certain conditions are met. These conditions include:

- Designating a responsible person in the organization whose name will be kept on file
- Training of the responsible person in the proper inspection and maintenance of the stormwater or flood control facility components
- Keeping copies of all inspection and maintenance records
- Periodic inspection, with frequency determined in the agreement, of all stormwater facilities
- Retained authority to conduct required maintenance at the expense of the delegate if the delegate neglects the responsibility
- Funding

Intergovernmental Agreements

Major stormwater or flood control facilities potentially affecting multiple jurisdictions should have a negotiated agreement for inspection and maintenance. Inspection and maintenance responsibilities for rivers and streams, in particular, must be assigned through cooperative intergovernmental agreements. The agreement must:

- Designate the government entity responsible for maintenance, with the name and title of the responsible party kept on file within all jurisdictions for which the agreement holds
- Provide that copies of stormwater and flood control facility inspection and maintenance records be kept in central stormwater files of each jurisdiction involved
- Provide for periodic meetings between all participating government entities to discuss facility maintenance
- Determine financing arrangements, fee schedule and fee allotment for all participating groups

Enforcing Responsibility

Maintenance neglected by one jurisdiction may affect many others. The DuPage County Stormwater Management Committee must retain the authority to perform maintenance that if otherwise neglected compromises good stormwater management practices of the county or another community. If the county does not promptly complete the necessary maintenance, concerned municipalities can petition the DuPage County Stormwater Management Committee for appropriate response.

CHAPTER 6

Regulatory Programs

Introduction

This chapter outlines the necessary standards for the regulatory framework of the Stormwater Management Plan. Standards are given for the following regulatory functions:

- General regulatory authority and responsibility
- Establishing permitting procedures
- Setting performance criteria

Authority and Responsibility

All stormwater management policies that require a response will be mandated by ordinance. Those policies that encourage an action will not necessarily be mandated by ordinance but will be included in DuPage County projects and will be required of projects cooperatively funded by the County. DuPage County has numerous municipalities (Figure 6-1) and county, state, and federal agencies with potentially overlapping responsibility and authority for stormwater management.

The stormwater management authorities of each agency must be clearly delineated in each appendix to the Stormwater Management Plan.

The effects of activities or developments taking place in a given local jurisdiction may be felt only outside that jurisdiction, in adjoining jurisdictions or even remote jurisdictions. The local jurisdiction is thus often reluctant to control an activity that has little deleterious effect within its boundaries. However, it is in the best interests of countywide stormwater management to control activities that threaten the objectives anywhere.

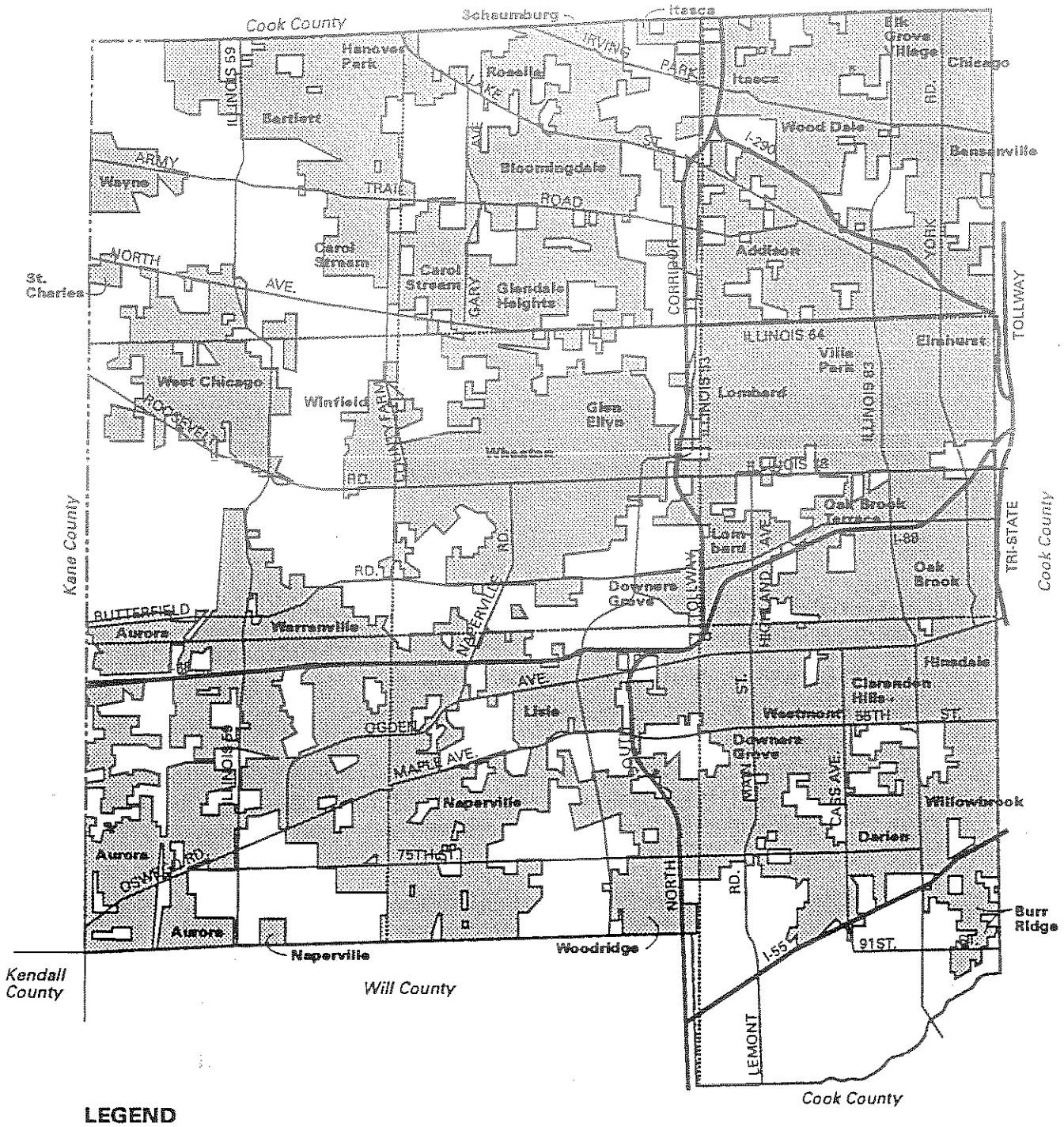
Ultimate regulatory authority will be at a jurisdictional level consistent with the scale of the impacts of the activity being regulated.

For example, the effects of improper sediment and erosion control practices are countywide because sediments are transported beyond municipal boundaries and deposited in adjoining municipalities; hence regulatory authority would appropriately be delegated beyond the municipal level. The operational efficiency of the plan may be enhanced if regulatory programs such as sediment and erosion control are delegated to a local level. Municipalities have developed staff capabilities in many of the stormwater management categories covered in the Plan and those staffs are knowledgeable of the specific localized problems in their communities. Local administration of a regulatory program will also provide a more responsive climate for the needs of citizens.

Routine regulatory activities will tend toward the municipal level as much as possible, with only necessary program authorization, delegation, and review coming from broader levels.

For example, the county could delegate sediment and erosion authority to qualifying municipalities. However, minimum, uniform standards must be incorporated and enforced in all regulatory programs if the objectives of the Plan are to be met.

Delegated regulatory programs must be consistent with and at least as stringent as those of all successively broader delegating authorities.



LEGEND

- TOWNSHIP LINE
- INCORPORATED LAND
- UNINCORPORATED LAND

N

SCALE: 1" ≈ 3 MILES

FIGURE 6-1
DuPage County Municipalities

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This does not preclude a more local level from enacting and enforcing regulations more stringent than those of the broader authority.

There are often very good reasons for more stringent controls in localized areas where additional protection is needed or desired. For example, the Committee might elect to provide additional wetland protection for all priority wetlands regardless of the nature of the threatening activity. It might also be desirable for a municipality to enforce tighter stormwater runoff release rates for specific tributaries with existing or projected flooding problems. The passage of a local ordinance that meets minimum criteria might not ensure effective implementation at that level. Oversight and revocation authority are essential to the long-term effectiveness of any regulatory program.

> ***Delegation of a regulatory program from a broader jurisdiction to a more local one must only occur with the broader jurisdiction retaining ultimate authority to provide program oversight and revoke the delegated program if deemed necessary because of lack of compliance or enforcement.***

Some regulatory categories have national or statewide significance and by law cannot be totally delegated. These include the state and federal regulatory programs for protection of surface water quality, wetlands, and the state's dam safety program. IDOT/DWR floodway construction regulations also mandate the agency's continued permit involvement for certain activities in the delegated programs (defined in 92 Ill. Adm. Code 708, Section 708.90 (i)). The existence of nondelegated programs does not preclude more stringent local initiatives. Where stormwater management objectives or policies require standards more stringent than national or state standards, the county will retain jurisdictional responsibility and authority. This will not, however, supplant the required state or federal authority over their less stringent standards.

Permitting Procedures

Permitting procedures will be established following the same general standards described above for regulatory authority and responsibility. For example, the jurisdiction where the effect of the activity being permitted primarily occurs will have ultimate permit authority. Permit authority can be delegated to a more local level as long as the more local level sets the minimum criteria, provides permit program oversight, and retains authority to revoke the delegated permit program.

Whenever permit procedures are updated, pre-existing permit programs will remain in effect until the county has established new procedures. This will provide continuity from existing programs to new ones. If appropriate, pre-existing permit programs will be modified to meet the minimum criteria consistent with the Plan. Where existing programs meet minimum criteria and are being administered effectively, there will be little advantage in requiring modifications.

As is the case with responsibility, certain state and federal permit programs cannot be delegated. These include the COE Section 404 and associated IEPA water quality certification, the COE Section 10, and the IDOT/DWR dam safety permit reviews.

Performance Criteria

Specific performance criteria will provide the technical basis for effective stormwater management in DuPage County. Examples of performance criteria include release rates for runoff control, designation of appropriate flood plain uses, detention basin design parameters, minimum management practices for sediment and erosion control, and appropriate mitigation for wetland or habitat alteration. General standards for setting performance criteria include the following:

- Minimum performance criteria will be established countywide by the Stormwater Management Committee.
- Countywide criteria will be at least as stringent as related state and federal criteria.
- Municipal criteria will be at least as stringent as countywide criteria.

Specific standards to set performance criteria for components of the stormwater management system are presented in Chapter 8. The criteria are established in the technical guidance of Appendix E and periodically updated as required in Chapter 10. These criteria should be incorporated into ordinances to ensure due process and to ensure that elected officials are responsible for the decisions. Having the full force of law behind the criteria and having them clearly identified will also facilitate uniform compliance and enforcement.

Performance criteria shall be formally incorporated into regulations and ordinances.

CHAPTER 7

Facility and Local Data

Introduction

All aspects of stormwater management, from planning and analysis through design and maintenance of facilities, require compilation of and reference to detailed data describing the stormwater and flood control facilities. Watershed planning requires extensive topographic, land use, meteorologic, and hydraulic data obtained from throughout the basin. Project design requires the same data, though on a site-specific basis. Maintenance of channels and structures also requires background data in the character and function of the facilities being managed.

Since data collection is time-consuming and costly, it is essential that it be performed as efficiently as possible. Furthermore, means and locations of data storage and data updating and retrieval mechanisms must be clearly defined so that all agencies requiring data have ready access to current information.

This chapter summarizes the kinds of data required and sets standards for their collection, storage, and retrieval. Chapter 10 presents standards for updating appendixes that document facility and local data.

Data Requirements and Compilation

Stormwater management data fall into three categories:

- **Facility Data** (Table 7-1), which consist of the physical dimensions and specifications necessary to evaluate the performance of each stormwater management facility (culvert, storm sewer, channel section) or other facilities (bridge, dam)
- **Maps** (Table 7-2), which address larger scale overview information
- **Time Series Data** (Table 7-3), which include information that must be gathered over a period of time and then summarized or used in sequential time dependent calculations for stormwater evaluation

Each category has unique requirements for compilation.

Facility Data

Physical survey information is most readily compiled from record plans (i.e., plan drawings updated after construction and verified to reflect the actual in-place configuration) or field surveys of drainage facilities and structures. If record plans are not available or are out of date, then the information must be acquired through field surveys. To minimize costs and provide more timely compilation of data pertinent to each stormwater management evaluation,

> ***Each agency with primary responsibility for permit review will require submittal of fully dimensioned record plans upon completion of construction for any facility in the flood plain.***

Data from record plans will not be available for many existing facilities, and it will be necessary to use ground survey or photogrammetric techniques to acquire the data. Appendix C, "Existing Systems," summarizes the data currently available.

Table 7-1 Required Facility Data

Facility Type	Required Data
Culverts	Location, water body, owner Entrance condition Photographs Length Dimensions of opening Upstream and downstream inverts Wingwall lengths and angles Skew angle Road profile Material and condition
Bridges	Location, water body, owner Photographs Sketch Length (along flow line) Dimensions of waterway opening including low chord elevation Section across bottom of bridge opening if free span Both upstream and downstream inverts Wingwall lengths and angles Skew angle Piers (location and dimensions) Road elevation (both elevation of road directly over the structure, and the low point of the road section)
Dams and Basin Outlets	Owner, jurisdictional status, dam safety report (if required) Location (stream and river mile) Cross section, and materials Emergency spillway geometry and materials Gate or outlet control geometry Upstream and downstream inverts Flood easement description, maintenance records
Impoundments	Bottom contours Materials Embankment cross sections
Pump Stations	Location, including intake and discharge points Capacity (by pump) Control sequence/set points
Structures in Flood Plain and Floodway	High water mark Locations, age, owner Elevations Descriptions Date of storm Photographs Source of information Buildings Locations, age, owner Type, including number of stories Flood damage history Elevation of first floor Elevation of low water entry points Assessed value Permanent parcel number
Channels	Roughness coefficient (Photographs or coefficients estimated by qualified hydraulic engineer) Cross sections extending beyond flood plain, located at each significant change in channel section

Table 7-2 Required Map Data

Type	Scale	Attributes
Topographic Within Flood Plain and Floodway	1" = 200' C.I. = 1'	Contours Streams and Lakes Culverts and Bridges Roadways and Buildings Quarter Section Corners
Other Areas	1" - 2,000' C.I. = 5'	Contours Streams and Lakes Bridges Roadways and Buildings Section Lines
Land Use (County Base Map)	1" = 400'	Streams and Lakes Bridges and Roadways Major Land Use Categories Quarter Section Corners
Soils	1:15,840 Scale	Photograph Base Soil Type Codes Section Corners
Aerial Photographs (Three-Year Updates)	1" = 400'	Photograph Base Quarter Section Corners
Flood Plain	1" = 200' C.I. = 1'	Contours Streams and Lakes Culverts and Bridges Roadways and Buildings Quarter Section Corners Regulatory Flood Plain
Wetlands and Habitat Areas (County Base Map)	1" = 400'	Streams and Lakes Bridges and Roadways Quarter Section Corners Wetlands and Habitat Areas

C.I. = Contour Interval

Table 7-3 Required Time Series Data

Time Series	Minimum Requirements
Precipitation	Hourly, more frequent in small catchment areas.
Streamflow Data	Daily for extended periods, hourly or shorter time interval for critical storms.
Runoff Data in Storm Sewers	Time interval shorter than time of concentration.
Water Quality Data	Reflecting range of conditions and pollutants experienced during and between storm periods.

Appendix C will be consulted and the available data collected from the sources listed there before any field surveys are undertaken.

When necessary facility data are not included in either record plans or references cited in Appendix C, then field surveys must be conducted to gather the data. Any appropriate techniques that meet the criteria listed in Appendix E, "Technical Guidelines," may be used.

Whenever field surveys are conducted in relation to stormwater facilities, the survey will compile all pertinent stormwater data as summarized in Tables 7-1, 7-2, and 7-3 in a manner consistent with current technical guidance presented in Chapter 8.

Maps

Several maps listed in Table 7-2 as essential to good stormwater management planning, design, and evaluation are seldom compiled solely for stormwater management. Rather, they are compiled by numerous agencies for a variety of purposes and merely referenced for stormwater evaluations. A major exception is that topographic maps suitable for stormwater management use are usually more detailed (i.e., have closer contour intervals) than those compiled for other purposes.

Whenever topographic maps are compiled for stormwater management, they will meet the accuracy, scale, and contour interval criteria specified in current technical guidelines.

Flood plain maps are compiled nationwide under the auspices of the Federal Emergency Management Agency (FEMA) to support the federally subsidized flood insurance program and disaster relief activities. Because of the unusually low topographic relief of DuPage County and the rapid development that occurs there, local requirements for flood plain mapping are more stringent than those applied nationwide. For example, FEMA flood plain maps are developed assuming existing upstream development and updated on about a 5-year cycle to reflect increasing development. In DuPage County, flood plain maps must be developed with due consideration given to ultimate upstream development since the period between undeveloped and fully developed watershed status is often a matter of months rather than decades.

Flood plain maps developed by or for DuPage County and municipalities within it will comply with the criteria consistent with county drainage characteristics and stormwater management policies.

Wetland and habitat maps are normally compiled on either a very detailed, high resolution scale suitable for site-specific environmental analysis or on a low resolution scale suitable for state or federal inventories.

For countywide stormwater management purposes, DuPage County will compile and maintain wetland and habitat maps at a uniform, intermediate scale appropriate for quick reference for stormwater facility impact evaluations.

Time Series Data

The need for time series data is often met through use of data from networks established by federal and state agencies:

- The National Oceanic and Atmospheric Administration (NOAA), which collects and compiles daily, hourly, and more frequent data at several locations in and near DuPage County
- The United States Geological Survey (USGS), which collects and compiles stream stage and streamflow data at several locations where streams flow in and through the county
- The Illinois Environmental Protection Agency (IEPA), which periodically collects and compiles water quality data on several county streams

Time series data networks change constantly to meet the needs and budgets of the collecting agencies, so they should be reviewed periodically in light of the county's stormwater management needs and augmented as necessary.

The DuPage County stormwater management division will periodically review time series data networks maintained within and near the county in light of the stormwater management time series requirements and establish programs (e.g., cooperative agreements or independent data networks) to collect and monitor data consistent with the county's stormwater management needs.

There also exists a large body of time series data (see Appendix C) collected for special studies and other purposes independent of these large data networks.

To minimize cost but maximize the understanding of the range of conditions experienced in the county, the data sources will be reviewed and used to the greatest extent possible before undertaking collection of new time series data.

Compilation and collection of water quality data present unique challenges because many programs are aimed toward evaluation of background or extreme low flow conditions. Data collected for those evaluations are usually of limited value in stormwater analyses. Stormwater-related water quality evaluations must address all portions of the hydrograph, both during storms and during subsequent low flow periods when sediments and pollutants transported by stormwater exert an influence in their deposition areas.

Water quality data collection and compilation efforts undertaken for the county or municipalities will reflect the full variation of hydrometeorologic conditions affecting and affected by stormwater.

Data Storage and Retrieval

Available data can be used only if their availability is known.

The DuPage County Stormwater Management Committee will maintain a current summary of available stormwater management data by periodically updating Appendix C.

Municipalities and agencies within the county will facilitate updating by transmitting summaries of available record plans, facilities data, or time series data to the DuPage County Stormwater Management Committee whenever they obtain updates of the data.

The use of the available data will be greatly enhanced if the data are stored in consistent formats.

Stormwater management data will be compiled and stored in digital formats consistent with the technical guidelines of the DuPage County Stormwater Management Plan. Where digital formats are not feasible, reproducible hard copy formats shall be used. Maps shall be compiled at standard scales: either 1" = 200' (specific sites), 1" = 2,000' (quad scale), or 1" = 2,400' (county base map).

Accessibility of the data will be maximized if most of it is made available in one location. The DuPage County Stormwater Management Committee technical staff will require frequent access to much of the data to fulfill its mandate of stormwater management coordination throughout the county.

The DuPage County Stormwater Management Committee will maintain current files of stormwater management data available throughout the county.

Municipalities and other agencies collecting stormwater management data within the county will transmit digital or reproducible hard copies of those data to the DuPage County Stormwater Management Committee regularly.

CHAPTER 8

Technical Requirements

Introduction

Technical guidelines and criteria are necessary to define procedures and techniques that are suitable for application in DuPage County and consistent with the objectives of the Stormwater Management Plan. Together, the guidelines and criteria provide a consistent basis for evaluating, designing, and reviewing stormwater management projects and programs. With clearly documented technical requirements, watershed areas covering several jurisdictions can be treated consistently. In addition, documented technical guidelines and criteria allow efficient transfer of experience necessary for training of government staff, engineers, and others involved in stormwater management.

Guidelines

Technical guidelines must provide clear explanation of factors important to evaluating, planning, and designing stormwater management projects and programs in DuPage County. The guidelines must address all aspects of technical assessment, from calculation through effectiveness assessment to alternative comparison. Minimum factors to be addressed in the technical guidelines are listed in Table 8-1.

Technical guidance should not, however, be so specific as to limit innovation. To best achieve the Plan objectives,

> ***Technical guidance should provide minimum performance requirements for all technical procedures essential to the stormwater management process, but should not preclude use of innovative technologies that can be shown to meet the minimum requirements.***

To facilitate the review process while also enhancing the equitability of project and program evaluations,

> ***Technical guidance should be specific and detailed enough to ensure consistency in procedures being used and reviewed throughout the county.***

A prime purpose of technical guidance is provision of information to the technical community (engineers, developers, government officials, permit agencies) that will enable them to perform evaluations that are simultaneously technically sound and useful in achieving the objectives of the Stormwater Management Plan. Many commonly used technologies are inapplicable to the realities of stormwater drainage in DuPage County.

> ***The technical guidance must provide clear definition of what factors are significant in determining the appropriateness of any particular technology proposed for application in DuPage County.***

Stormwater management evaluations and designs often consider a scope more limited than that encompassed in the Stormwater Management Plan. Consequently, many common technologies ignore factors significant to achieving the Plan objectives. For example, only the more advanced texts in stormwater management address the impacts of wetland drainage on downstream flooding, yet it will not be possible to mitigate future stormwater damages in DuPage County if these impacts are not considered.

Table 8-1 Minimum Technical Guidance Considerations

Design life

Stormwater volume calculations

Calculation of release rates appropriate for the downstream drainage system

Small-scale methods to minimize increased stormwater runoff from new land development

Evaluation of water quality impacts of stormwater management and mitigation measures

Nonpoint pollution problems and the actions that can reduce the effects of runoff on water quality

Identification of major and unique environmental features potentially impacted by stormwater projects

Procedures to consider and mitigate the effects of proposed stormwater management improvements on riparian and wetland environments

Velocity limitations and energy dissipation requirements to limit stream erosion

Procedures to evaluate the natural functions of stream channels and ways to protect and maintain those functions

Evaluation of the effects of sustained increases in frequent flows on stream erosion

Data requirements and collection techniques

Hydrologic procedures:

- Design condition volume, intensity, temporal and spatial distribution
- Drainage area definition
- Land use/land surface cover representation
- Runoff calculation
- Design development conditions

Target level of protection determination

Open channel hydraulics:

- Boundary (upstream and downstream) conditions
- Selection of velocity limitations for channel lining materials
- Selection of Manning's roughness coefficient values
- Side channel flow
- Backwater computations
- Lost storage computations
- Restricted conveyance computation

Minimum easement dimensions for access to and maintenance of public stormwater facilities

Mitigation of the effects of lost flood plain storage on downstream areas

Gutter and inlet hydraulics

Storm sewer and culvert hydraulics:

- Pressure and open channel flow
- Energy loss calculation
- Tailwater conditions
- Inlet and outlet control

Bridge hydraulics:

- Scour
- Roadway overtopping
- Approach overtopping

Storage hydraulics:

- Outlet requirements
- Stage/discharge
- Stage/storage

Erosion and sediment control

Subsurface drainage:

- Recharge, infiltration, and filtering rates
- Methods for determining hydraulic conductivity values
- Groundwater contamination potential

Technical guidelines must be sufficiently comprehensive to address all of the DuPage County stormwater management objectives.

Technical guidelines, therefore, must include not only procedures for evaluating and designing flood mitigation measures, but also:

- Potential flooding impacts, both upstream and downstream
- Water quality impacts of proposed stormwater management techniques
- Impacts of changes in available storage, whether in flood plains, wetlands, or structures
- Equitability, effectiveness, costs, and legal implications of all proposed projects or programs

Criteria

Clear criteria can greatly facilitate evaluation and review of stormwater management projects and programs by enabling objective comparisons of their relationship to the standards of the Stormwater Management Plan.

Minimum technical criteria necessary to achieve stormwater management plan objectives should be clearly and objectively defined.

Overly restrictive criteria can stifle innovation. In addition, restrictive criteria may be perceived as arbitrary and subject to legal challenge. Consequently,

Technical criteria should be defined only where necessary to support achievement of the objectives.

The prime focus of the technical criteria is to provide "checklist" objective definitions of what is or is not consistent with the objectives and standards included in the Plan. At a minimum, it is necessary to define criteria that:

- Ensure consistency with watershed capacities (e.g., release rates not accumulating to exceed downstream carrying capacity)
- Provide a balance throughout the system (e.g., sufficient storage is provided to compensate for restricted downstream capacity)
- Are legally consistent (e.g., do not controvert valid intergovernmental agreements)
- Are technically achievable

CHAPTER 9

Funding

Introduction

The state-authorized adoption of a dedicated property tax levy (P.A. 85-905) to fund stormwater management activities in DuPage County provides an important source of funds for development and execution of consistent countywide procedures. However, this single source is not likely to be sufficient for all the stormwater capital, operation, and maintenance needs. As new regulations are adopted, watershed plans are developed, and facilities are constructed, new funding requirements for increased activities will result. A combination of funding options must be considered in developing and subsequently updating the Funding Plan (Appendix G).

Funding requirements will be estimated initially and periodically in the problems and projects evaluations (Appendix H), maintenance program (Appendix I), and the County Stormwater Division annual budget evaluation. The funding needs will be compared to available revenues in the initial and annual update of the Funding Plan to determine the amounts and timing requirements for additional funding.

This chapter provides a summary of funding options to consider, along with planning standards for developing and implementing the methods selected.

Funding Options

Stormwater management funding options are to be evaluated based upon the following categories:

- **Legal Impact** - How difficult, under prevailing law, would it be to implement this funding source?
- **Equity** - How well does this source distribute the costs between those contributing to the problem, those benefiting from the programs, and those paying the fees?
- **Revenue Capacity** - How much money can this source generate?
- **Complexity** - How complex are the steps necessary to develop the revenue source?
- **Ability to Fund** - Can the funding source be used to fund the major categories of stormwater management costs?

Funding options to be considered are briefly discussed below.

General fund ad valorem taxes have traditionally provided a significant source of funding for stormwater management activities. Since the money is allocated each year during the general government budgetary process, in which many activities must compete to obtain funding, the availability of funding for long-term projects is limited. Supplementing these taxes with a local option dedicated stormwater management property tax addresses this shortcoming. However, further options must now be considered to obtain more state and federal funds or otherwise subsidize the local cost for stormwater management activities.

Tax revenue from a special taxing district or special assessment district is available for use in the designated special area. This option may be suitable for specific projects in designated areas.

Revenue from permitting and inspection fees can be used to offset the cost of reviewing permit applications and inspecting stormwater construction projects. Unless fees are set high enough to cover actual costs (seldom the case), other funding sources must supplement the cost of processing permit applications.

Similar to the fees discussed above, penalties and fines provide limited revenue. Since collection of fines is dependent on enforcement actions for regulatory violations, the timing and amount of collection is uncertain.

A stormwater management utility provides funding for stormwater activities by charging service fees generally based on property contributions to runoff. Property that generates larger quantities of runoff is charged higher stormwater utility fees. Since this is not a tax, all properties pay for services, unlike the ad valorem tax, which is not charged for tax exempt property. Service fees provide a reliable, long-term dedicated source of funding that must be spent on stormwater management services.

General obligation, revenue, or special assessment bonds are sold by local governments to provide capital for large construction projects. The operation and maintenance cost of the resulting facilities can be capitalized and included in the bond request. The primary disadvantage of selling bonds is that long-term debt is incurred. On the other hand, large-scale construction projects can be initiated when improvements are needed rather than waiting to raise funds.

A homeowners' association is a private organization of residential property owners that collects an annual fee, a portion of which can be used to construct or maintain stormwater facilities in a designated residential area. This type of funding keeps the responsibility at the lowest jurisdictional level but has a limited capacity to generate money for capital improvements and may not be a constant and reliable long-term source since it covers only limited areas and generates little revenue.

Development impact fees provide an alternative for requiring developers to construct or pay for stormwater management facilities. The impact fees are usually front-end charges to allow construction of needed facilities. Site-specific charges must be determined based on the local impact of a development or contribution to watershed problems. This approach allows the local government to construct regional facilities or upgrade deficient downstream systems using an appropriate contribution from the developer. However, since the impact fee from a single development usually does not provide enough revenue to fund a regional project, an agency must fund such projects and be paid back through recapture fees. As a result, needed improvements could be delayed. In addition, this option does not directly provide for operation and maintenance funding.

The availability of state or federal cost participation is limited to specific areas for specific purposes. For example, the federal government provides Community Development Block Grant funds that can be used to pave streets and install drainage facilities in existing communities. Since this funding is subject to compliance with strict criteria and funds are limited for the many communities that apply, it cannot provide significant stormwater management funding. There is also the Corps of Engineers Water Resources Development Act, which allows cost sharing for certain project categories. Although funding potential from these sources is limited, it is important to stay familiar with them to seize any available opportunity. In particular, state and federal funding participation is often available for cooperative development of major stormwater projects to alleviate existing problems.

Planning Standards

Standards for evaluating funding options provide a basis to consider local concerns and prepare a funding plan to meet identified needs. As mentioned in the introduction, a Funding Plan will be

developed and updated. Development of the plan must be consistent with many other components of the Stormwater Management Plan that determine funding requirements, project priorities, jurisdictional responsibilities, and so on.

Because many factors and considerations are subject to change, the Funding Plan must be periodically reviewed and updated. Standards for the development, evaluation, and update of the Funding Plan are:

- Promote efficient use of public monies for stormwater construction projects
- Establish a functional drainage system that will not require excessive and costly maintenance activities; e.g., consider life cycle as well as capital costs
- Provide clear project funding priorities
- Provide sources of revenue sufficient to cover all stormwater management costs
- Provide diversity in revenue sources
- Involve the public during plan development to secure local acceptance
- Provide for long-term funding so that facilities can be maintained, repaired, and replaced
- Distribute costs so that charges are equitably assigned to those who use or benefit from the stormwater management facilities
- Account for inflation when developing long-term budgets
- Maximize the use of existing billing and collection procedures to minimize the costs of implementing and maintaining funding options
- Solicit local cooperation and participation within the watershed to fund regional projects
- Maximize capture of state and federal participation

CHAPTER 10

Implementation and Enforcement

Introduction

The successful implementation and enforcement of the DuPage County Stormwater Management Plan requires:

- Close coordination and cooperation between all municipalities and agencies having stormwater management responsibility in DuPage County
- Periodic review and update of the plan appendices to ensure their adequacy and the appropriate level of completeness
- Periodic inspection to identify deviations from the plan, followed by timely enforcement action where noncompliance is noted
- Provision of adequate funds to accomplish the implementation and enforcement

This chapter provides standards for achieving these key requirements.

Coordination and Cooperation

Coordination and cooperation between the DuPage County Stormwater Management Committee and local municipalities is the key factor in determining the achievement of the Plan objectives. All agencies or concerned persons who have authority, responsibility, or interest in DuPage County's stormwater management should be actively assisted to understand, accept, and participate in the plan. Table D-1 in Appendix D, "Institutional Programs," contains a current listing of agencies whose cooperation is actively sought.

> ***Implementation of the Stormwater Management Plan must be actively coordinated with all municipalities within DuPage County, all countywide agencies, and all adjacent counties.***

Cooperation and coordination will be achieved primarily through two programs maintained by the Stormwater Management Committee and its staff:

- Information exchange program
- Technical coordination program

Information Exchange Program

The information exchange program will include:

- Regular fact sheet mailings to cooperating agencies
- Development, updating, and dissemination of guidance documents
- Sponsorship of training programs for
  - Citizens and land owners
  - Public officials
  - Permit review and inspection personnel
  - Design engineers
  - Developers and builders associations
  - Homeowners

Information exchange is essential to disseminate the understanding necessary to foster compliance with the Stormwater Management Plan. New citizens and land owners in the county are often unaware of the dangers of flood hazard and the importance of flood preparedness.

The information exchange programs will emphasize public awareness and training regarding the importance of flood preparedness, including specific training on installation and maintenance of floodproofing techniques.

Similarly, design engineers and permit review and inspection personnel new to DuPage County are often unaware of the unique technical requirements of designing for stormwater management where onsite watershed storage is preferred to conveyance for site runoff control. They are also unaware of the major drainage system constraints imposed by the county's low relief and extensive overbank storage characteristics.

Information exchange programs will include dissemination of technical guidance and training programs to increase designer and reviewer awareness and understanding of the unique requirements of stormwater management in DuPage County.

Finally, the environmental objectives of the plan regarding water quality, habitat, and wetland enhancement require that the public and technical community be aware of the effects of their actions. For example, water quality can be greatly enhanced if property owners and designers direct runoff from their property across a strip of vegetation rather than directly into the waterways. The vegetated strip can also provide excellent wildlife habitat if properly managed. If property owners are aware of the benefits of such actions, they will be more likely to cooperate.

Information exchange programs will disseminate information on the benefits and techniques of environmental protection activities that affect water quality, quantity, and habitats.

Technical Coordination

Technical coordination will be partially achieved through dissemination of the technical guidance information. In addition, the Stormwater Management Committee will maintain staff, models, and a data repository to improve access to the understanding, tools, and data essential to good stormwater management practices in DuPage County.

Several policies and standards of the Stormwater Management Plan require that all stormwater projects be evaluated in terms of their overall watershed impacts.

The Stormwater Management Committee will maintain staff and programs to provide prompt and technically competent review of projects for consistency with the objectives of the Stormwater Management Plan and watershed plans.

The models developed as part of the watershed plans are an essential tool in making these evaluations. To avoid duplication of the extensive effort required to develop the models, they should be made available to those responsible for project evaluation.

The Stormwater Management Committee and its staff will make the watershed models available to other agencies, either through cooperative agreements to perform modeling analysis or through dissemination of program code, documentation, and input streams at cost.

The data required to design or review a particular site runoff control project or a regional stormwater project are extensive and costly to obtain. They are similar to the data required to develop good watershed plans.

The Stormwater Management Committee and its staff will compile pertinent stormwater management data while developing watershed plans and will thereafter maintain those data, updated through cooperation with other agencies, in a central data repository accessible at cost to agencies or designers involved in stormwater management in DuPage County.

Inspection and Enforcement

The DuPage County Stormwater Management Committee and its staff have primary responsibility for implementing all aspects of the Stormwater Management Plan. Because much of that responsibility is delegated to other agencies and because compliance must be maintained through all steps of development (concept, design, construction, operation, and maintenance), the Committee requires staff and programs to inspect compliance.

The Committee will maintain staff and programs sufficient to inspect compliance with the objectives of the Stormwater Management Plan.

Compliance inspection will include:

- Periodic audits of permit review, inspection, and maintenance programs of each agency delegated responsibility for implementing aspects of the Stormwater Management Plan
- Frequent inspection of all ongoing construction and development covered under the countywide stormwater management ordinances
- Prompt inspection of all problems identified as emergency, critical, or serious
- Annual inspection and status reporting on all problems identified as incremental or repetitious

Compliance with the Stormwater Management Plan will be effective only if prompt and effective enforcement action is taken in all cases where inspection reveals noncompliance. Enforcement standards for the Stormwater Management Plan are as follows:

- All ordinances enacted to implement the Stormwater Management Plan must include mandatory enforcement schedules and penalties to be imposed for noncompliance.
- The Stormwater Management Committee must be granted authority to impose the penalties specified in the countywide stormwater management ordinances.
- In all agreements, ordinances, and other delegations of authority, the Stormwater Management Committee will retain authority to withdraw delegation of responsibility in the event of inadequate compliance, inspection, maintenance, or enforcement.
- All agreements, ordinances, and other delegations of authority will provide the Stormwater Management Committee right of access to maintain facilities.
- All agreements, ordinances, and other delegations of authority will include provisions for owner reimbursement of costs incurred by the Stormwater Management Committee or its delegate in correcting violations of the provisions of the Stormwater Management Plan.

Funding

Funding for implementation of the provisions of the Stormwater Management Plan is discussed in Appendix G, "Funding Plan." A key feature of funding standards (see Chapter 9) is stressed here since the success of the implementation plan depends heavily on a well-developed and implementable funding plan.

The annual funding plan update and subsequent budget request must provide funding for Stormwater Management Committee staff sufficient to carry out its duties as specified in the implementation plan. The duties include information exchange, appendix updates, inspection, and enforcement actions.

Updates

The DuPage County Stormwater Management Plan contains objectives and standards that will seldom require updating. Aspects of stormwater management planning that are more variable are confined to the following plan appendices:

- Appendix A, "Terms and Definitions" - Lists and defines terms frequently used in stormwater management. The definitions will provide a common basis of understanding for potentially ambiguous terms.
- Appendix B, "Bibliography" - Provides bibliographic information for references used in developing the Stormwater Management Plan. It will serve as a reference for further information.
- Appendix C, "Existing Systems" - Summarizes the current status of stormwater management facilities and practices in the county. It serves as a ready reference for data or concepts necessary for further planning, evaluation, or design.
- Appendix D, "Institutional Programs" - Describes institutional structures and agreements for implementation of the Plan. It includes recommendations for modifying existing institutional arrangements as necessary to better meet Plan objectives, as well as a suggested institutional implementation plan and schedule.
- Appendix E, "Performance Criteria and Technical Guidelines" - Evaluates and recommends performance criteria to be incorporated in stormwater management ordinances, plan reviews, and design. It further suggests technical guidance methods and manuals to be used in developing plans to meet the performance criteria.
- Appendix F, "Ordinances" - Describes the development of ordinances containing the minimum criteria and standards necessary to achieve Plan objectives. It includes current copies of recommended ordinances, as well as jurisdictional recommendations for changes necessary to meet the minimum criteria of the countywide ordinances.
- Appendix G, "Funding Plan" - Estimates overall costs of the Stormwater Management Plan. It evaluates alternative methods of funding all aspects of the program and recommends how each major aspect of the program should be funded. The recommendations are specific for the near term, subject to periodic update as potential revenue sources change.
- Appendix H, "Problems, Studies and Improvement Projects" - Summarizes the current status of known stormwater management problems and efforts underway to address or alleviate those problems. It also evaluates and recommends a program for future problem recording, evaluation and response.
- Appendix I, "Maintenance Programs" - Contains criteria and guidance for maintenance of stormwater management facilities. It also contains recommendations and descriptions of cooperative programs where the municipalities and the County can share expertise or resources to improve maintenance systems.
- Appendix J, "Water Quality Enhancements" - Addresses the water quality impacts of stormwater management practices in DuPage County. It does not attempt to provide a full water quality management plan, but focuses on the impacts and enhancements possible through stormwater management. It briefly summarizes the current status of water quality in DuPage County lakes and streams, describes how stormwater management practices probably affect that quality, and makes recommendations for practice modifications to reduce adverse impacts of stormwater management and, where feasible, further enhance water quality.
- Appendix K, "Wetland and Riparian Environment Protection" - Provides identification and evaluation of wetland and riparian environment protection needs in DuPage County. It summarizes resources requiring special consideration, as well as documenting the significance of these resources to both flood control and environmental health. It includes recommendations for wetland and riparian environment protection evaluations to be included in all stormwater management evaluations.

- Appendix L, "Salt Creek Watershed Plan"
- Appendix M, "East Branch DuPage River Watershed Plan"
- Appendix N, "West Branch DuPage River Watershed Plan"
- Appendix O, "Sawmill Creek Watershed Plan"
- Appendix P, "Des Plaines River Tributaries Watershed Plan"
- Appendix Q, "Fox River Tributaries Watershed Plan"

- Contain the details of programs and projects recommended for each watershed. They summarize a comprehensive evaluation of the watershed capacities, needs and recommendations. They provide the basis, including models and specific criteria, for evaluating the overall impacts of any proposed projects or improvements within the watershed.

- Appendix R, "Training and Public Information" - Summarizes a program to keep those parties critical to the success of the Stormwater Management Plan aware of the provisions and requirements of the Plan. Programs will be directed toward at least designers and consultants, permit reviewers, public officials, and the general public.

The appendices will be periodically reviewed and updated.

Table 10-1 contains standards for the minimum update frequency of each appendix. All updates must be consistent with the objectives, policies, and standards of the Stormwater Management Plan.

The annual update of the "Existing Systems," "Problems, Studies, and Improvements Projects," and "Funding Plan" appendices will provide the basis for the stormwater management budget for the following year.

To provide continuity and consistency in the budgeting process, annual updates will include a detailed program for the following year, a 5-year program, and a reaffirmation or update of the ultimate plan.

Responsibility for maintaining the appendix update schedule lies with the Stormwater Management Committee and its staff. Review and update of each appendix will include verification that the information in the appendix is current and accurate, updating any inaccurate or outdated portions, and disseminating the updates consistent with the standards of the information dissemination program.

All updates will be subject to review and adoption by the Stormwater Management Committee. Updates that involve model ordinances or minimum criteria will be distributed to the cooperating agencies for review and comment before approval and adoption by the Stormwater Management Committee. Updates to countywide stormwater management ordinances will require adoption by the DuPage County Board.

Table 10-1 Appendix Update Frequency

Appendix		Update Frequency
A	Terminology	Every 5 years
B	Bibliography	Annually
C	Existing Systems	Annually
D	Institutional Programs	Every 5 years
E	Performance Criteria and Technical Guidelines	Every 5 years
F	Ordinances	Every 5 years
G	Funding Plan	Annually
H	Problems and Improvement Projects	Annually
I	Maintenance Programs	Every 5 years
J	Water Quality Enhancements	Every 5 years
K	Wetland, Aquatic and Riparian Environment Protection	Every 5 years
L-Q	Watershed Plans	Every 5 years