



The Florida Senate

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THE DEVELOPMENT OF STORMWATER TREATMENT FACILITIES FOR TRANSPORTATION PROJECTS

Statement of the Issue

The Florida Department of Transportation (FDOT) operates under federal, state, and local laws and regulations relating to storm water management when developing transportation projects. Stormwater quantity regulations for transportation projects exist to assure that the post-development peak discharge rate and, for land locked basins, volume, does not exceed pre-development levels. Current stormwater quality regulations are based upon a target removal of 80% of the post development total suspended solids loading. Rules currently proposed by the Florida Department of Environmental Protection (FDEP) and United States Environmental Protection Agency (USEPA) would require design methods targeting additional removal of nutrients (nitrogen and phosphorus). Paramount in virtually all treatment plans is the temporary storage of stormwater runoff in ponds or swales. The engineering of stormwater facilities, and the acquisition of properties to accommodate them, begins early in the transportation project's development and can result in the consumption of a sizable portion of a transportation facility's budget.

Discussion

The development of additional impervious surfaces increases both the volume of stormwater runoff and the peak rate of flow resulting from a storm event. Thus, when natural terrain is converted to impervious surfaces, *e.g.*, paving a roadway, stormwater must be managed to avoid an increase in downstream discharge that might cause an increase in downstream flooding. Higher velocity and greater quantity of flow can also cause erosion and impacts to aquatic habitat.

Stormwater runoff from roadways and associated facilities can impact natural waterway systems if not properly managed, in that such runoff typically contains pollutants from motorized vehicle operation. For example, the wearing of brake linings, thrust bearings, engine crankshafts, and tires may result in the deposition of heavy metal particles on the roadway surface. Similarly, the dripping of oil and other engine fluids may deposit additional heavy metals, hydrocarbons, and other pollutants on the roadway surface. Litter, organic debris, and other materials that are common in roadway corridors may also contribute to the pollutant loading in roadway runoff. While the runoff discharged from highways and other parts of the transportation infrastructure represents only a portion of the runoff affecting nearby water bodies, it can contribute to the cumulative degradation of those waters.

Construction activities can also contaminate stormwater and nearby surface waters with silt from disruption of vegetative ground cover; oil, heavy metals, and other pollutants resulting from the operation of construction vehicles; runoff from areas where solvents, paints, and other liquid materials are used and stored; leaching of asphalt emulsion and concrete slurry; and a variety of other sources. These impacts can be avoided if appropriate actions are taken to control construction site runoff quality.

Federal Regulation of Stormwater

To address the negative impacts of runoff, the federal government has implemented regulations with the intent of ameliorating the widespread environmental impacts of stormwater. Three landmark congressional acts guide the federal regulation of stormwater mitigation:

National Environmental Policy Act

The National Environmental Policy Act¹ (NEPA), requires that all major actions sponsored, funded, permitted, or approved by federal agencies undergo environmental planning. This planning ensures that environmental considerations, such as impacts on water quality, are given appropriate consideration in decision-making.²

Clean Water Act

The Water Pollution Control Act,³ better known as the Clean Water Act (CWA), provides for comprehensive federal regulation of all sources of water pollution.⁴ It prohibits the discharge of pollutants from non-permitted sources. The CWA authorizes the U.S. Environmental Protection Agency (USEPA) to administer or delegate water quality regulations covered under the act. In Florida, USEPA has delegated administrative authority of the CWA to FDEP except on tribal and Federal lands.

Endangered Species Act (ESA)

The Endangered Species Act⁵ (ESA) is administered by the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service. Federal intervention or consultation under the act is triggered by permits, funding or actions on federal land, and by the potential harm, harassment, or taking of listed species, as well as impacts to listed species' habitat. Informal consultation, under Section 10 of the act, requires applicants to comply with the Endangered Species Act (ESA) even if a federal nexus does not exist. The ESA has relevance to surface water quality because of potential effects on listed aquatic species.

Florida's Stormwater Management Practices, Policies, Procedures, and Regulations

In addition to various municipal and county codes regulating stormwater, FDEP, being the lead State agency for regulating water quality, has established State water quality standards and design and performance standards for stormwater management facilities. These standards are incorporated into the rules of the FDEP and the Water Management Districts (WMDs). Depending on the site location, new development will be required (through the permitting process) to meet the FDEP and/or WMD rules. Compliance with these rules assures that new development meets the standards, statutes, and other regulations. It is the policy of the WMDs and FDEP to regulate and control the management and storage of surface waters pursuant to chapter 373, F.S. and Chapter 62-40, FAC. The WMDs generally regulate construction of new facilities and alterations to existing systems. The water quality portion of the WMD permit requires the project be designed such that discharges meet the performance standards established in Chapter 62-40, FAC. The FDEP or WMDs may also impose additional water quality treatment requirements in order to meet specific Total Maximum Daily Load (TMDL) or Basin Management Action Plan (BMAP) requirements, typically involving treatment to remove additional nutrient (nitrogen and phosphorus) loading.

FDOT has specific policies, procedures, guidelines, and regulations for protecting surface water. Chapter 14-86, FAC, Drainage Connections, provides standards and procedures for drainage connections from the properties adjacent to the FDOT Rights-of-way.

Addressing the Effects of Stormwater from Transportation Projects

Transportation projects, which tend to be linear in nature and receive runoff from numerous adjacent properties, may encompass multiple drainage basins and impact multiple receiving waters. The impacts of stormwater runoff from state-owned rights of way vary widely, depending on surrounding land use, climate patterns, soil characteristics, receiving water characteristics, and other local factors. The construction of roadway improvement projects may also impact receiving waters if soil erosion is not properly managed during the construction process.

¹ 42 U.S.C. 4321

² NEPA implementing regulations are at 23 CFR 771 (FHWA) and 40 CFR 1500-1508 (CEQ). For details on NEPA procedures, see Chapters 410, 411, and 412.

³ 33 U.S.C. 1251 et seq.

⁴ Implementation requirements for CWA Sections 303(d), 305(b), 401, 402, and 404 are described in Section 430.06.

⁵ 7 U.S.C. 136, 16 U.S.C. 1531 et seq.

The key to controlling problems created by stormwater runoff is the application of best management practices (BMPs). BMPs are defined as physical, structural, and managerial practices that, when used individually or in combination, prevent or reduce pollution of water and attenuate peak flows and volumes. BMPs targeting the types of problems discussed above are typically categorized as temporary or permanent. Temporary BMPs (e.g., mulching of bare ground, silt fencing, and spill containment) are typically used only during the construction phase of a project. Permanent BMPs are used to control and treat runoff throughout operation of the highway, park-and-ride lots, rest areas, or other transportation project sites. Some BMPs, such as detention ponds, may function in both temporary and permanent BMP capacities.

Permanent runoff treatment BMPs include facilities that remove pollutants from runoff by dilution, simple gravity settling of particulate matter, filtration, biological uptake, and/or soil adsorption. Typical examples include wet detention ponds, dry retention ponds, underground exfiltration trenches (also called French drains), and vegetated swales. These BMPs also reduce the peak rate of runoff during a storm event by storing the flow and releasing it at a slower rate, thus protecting downstream properties from increased flooding. Permanent BMPs are used to treat highway runoff for the design life of the project site.

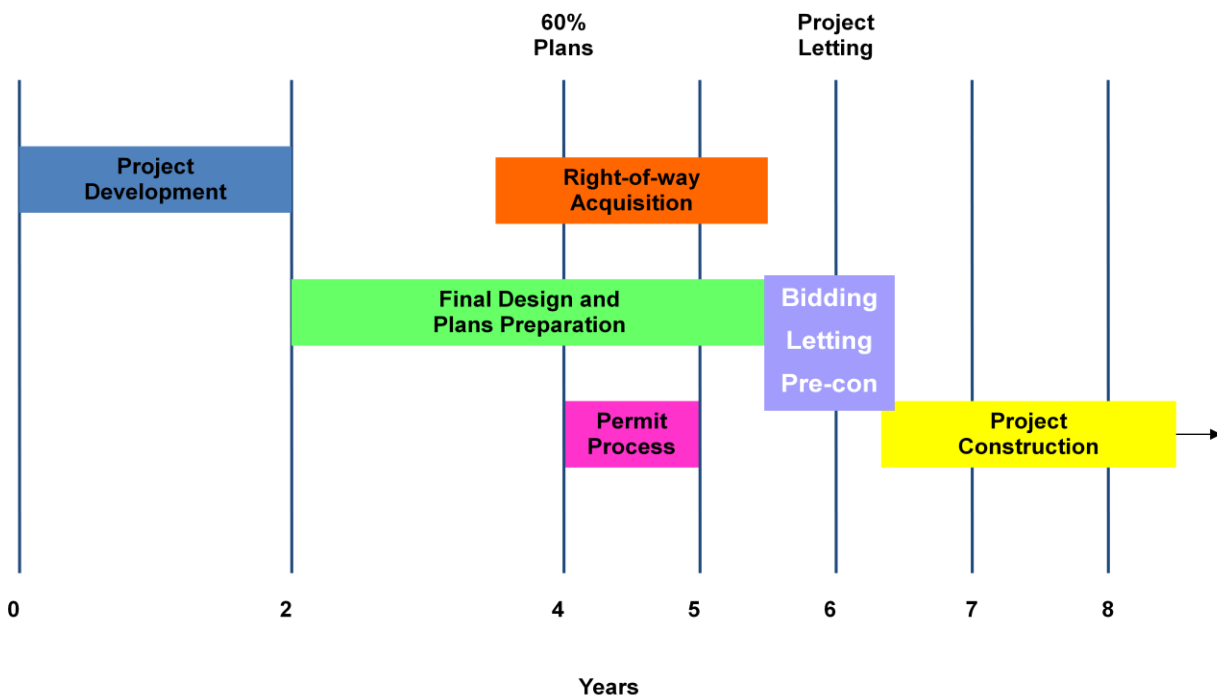
Stormwater Management Design Overview

Most major transportation projects are developed over many years in phases. The typical project is developed by progressing through the following phases:

1. Planning
2. Project Development and Environment (PD&E)
3. Design
4. Right of Way
5. Construction.

A typical timeline for major projects is illustrated below:

FDOT Project Timeline



The development of the design for stormwater management facilities for a transportation project involves a significant amount of data gathering, as well as extensive coordination among various individuals and agencies. It typically begins in the PD&E phase. Along with other project development tasks, the results of the PD&E Study are used by FDOT to document that proposed improvements to an existing corridor or the establishment of a new corridor comply with NEPA requirements. The PD&E Study process incorporates the development of various alternatives for the proposed roadway improvements. As part of the development of these roadway alternatives, various stormwater management practices are considered. These practices include the following:

- *Swale systems*: This type of system consists of a series of road side swales sometimes referred to as linear ponds for the storage of stormwater. Two types of swale systems are typically utilized, dry retention and dry detention. These systems typically do not require additional right-of-way acquisition with their associated stormwater facilities being contained within the road right-of-way template. Note: This type of system poses moderate maintenance concerns with mowing and standing water.
- *Adjacent Property Stormwater Management Systems*: On some occasions proposed or existing residential subdivisions or commercial properties have been designed to accommodate adjacent roadway drainage into their respective stormwater management systems. This typically occurs as part of the municipal or county development process. These types of requirements are sometimes imposed and documented in the adjacent property's "Development Order" as mandated by the respective municipality or county issuing the permits for construction of the respective development. When this situation occurs, the need for additional right-of-way for the roadway stormwater management system is typically reduced. However, storage and flowage easements may be required. If this has not been required by the County or Municipality, in some instances the department has been able to negotiate receipt of its stormwater with the developer of the adjacent property. Note: This type of system poses low maintenance concerns, since maintenance is typically handled through maintenance agreements with the property owner assuming the maintenance responsibilities. The agreements however, must include language that if the property owner is not maintaining the facilities, the department has the legal right to enter onto their property, correct the situation, and back charge the property owner.
- *Isolated Wet or Dry Stormwater Pond Systems (Positive Outfall Systems)*: When isolated ponds are required to meet the stormwater management requirements of a project, additional right-of-way is necessary. These ponds can be constructed as either wet or dry detention or retention systems. Each system type has its advantages and disadvantages which can result in large right-of-way needs depending on the project parameters. These types of systems typically possess an outfall which influences the amount of right-of-way required for the pond. The key issue with the use of a dry system is to have adequate hydraulic conductivity of the soil and proper separation between the pond bottom and the seasonal high ground water table. Note: This type of system requires ongoing maintenance.
- *Isolated Wet or Dry Stormwater Pond Systems (Closed Basin Systems)*: This type of system is similar to the positive system in that right-of-way is required outside the roadway typical section. Thus additional right-of-way is required for the construction of isolated ponds. The only exception with this system is that the respective pond is located within a drainage basin that does not have a positive outfall (landlocked areas). These types of systems typically are required to contain larger storm events and thus require more right-of-way to meet the needs of the project. Note: This type of system requires ongoing maintenance.
- *Exfiltration Trenches (French drains)*: This type of system consists of a piped drainage system with sections of perforated pipe surrounded by a rock filled trench wrapped in filter fabric. Stormwater is typically exfiltrated into the ground through the porous stones utilizing the head differential between the water level in the trench and the ground water table. Stormwater storage capacity is attained within the trench. Use of this type of system is typically seen in an urban environment, with soils containing a high ability to conduct groundwater. This system does not typically require right-of-way acquisition for the construction of the stormwater management facilities. Note: This type of system requires high maintenance and may not continue to function as long as other BMPs.

Pond Siting

Once it has been determined what stormwater management system is necessary to meet project requirements, the process known as "Pond Siting" will commence. The "Pond Siting" process documents and justifies the selection of a specific site for the construction of stormwater management facilities. The evaluation of various candidate sites weighs and balances numerous factors such as cost, maintainability, constructability, public opinion, aesthetics, environmental impacts, social impacts, and cultural impacts. The costs of right of way, environmental impacts, construction, and long term maintenance are usually the easiest factors to estimate and compare. Other factors are more subjective and qualitative. Numerous design features (depth, size, shape, treatment method, etc.) can be modified to accommodate a pond site. However, hydraulic constraints may preclude the use of some sites, *e.g.*, a site may be higher than the facility from which it is to accept runoff. Alternate sites and their different design features will usually result in different costs and impacts.

The Pond Siting process encompasses a significant amount of coordination between numerous engineering and environmental disciplines. The amount of work effort can vary significantly based on environmental issues and project location. The documentation produced by the pond siting process is used for the justification of any necessary right-of-way acquisition associated with meeting the stormwater management requirements of a proposed roadway project. This justification is also required to satisfy the public necessity requirement in an eminent domain lawsuit. Because a broad range of subjects is involved, FDOT uses a multi functional team approach to select the most appropriate pond site. This team approach usually includes representatives from the following offices:

- Right of Way,
- Design,
- Drainage,
- Environmental Management,
- Maintenance,
- Construction, and
- Legal (eminent domain).

At times other units may provide critical information to the evaluation process.

The FDOT Stormwater Management Facility Handbook (January 2004) provides the following pond siting selection considerations:

1. Use existing FDOT properties or other state owned property, if feasible.
2. Minimize the number of parcels required. For example, avoid using part of two parcels when the pond will fit within one.
3. Generally, property owners prefer to have ponds placed toward the rear of their property. For parcels that abut the roadway right of way, the portion of the parcel next to the road is usually the most expensive.
4. Avoid splitting a parcel, thus creating two independent parcel remainders.
5. Consider the parcels identified by the right of way office. Even if a parcel is not large enough to provide all the stormwater management, it may be large enough to provide the treatment for stormwater quality. Or it could replace treatment and attenuation for parcels adjacent to the road that will have their ponds removed because of the road improvements
6. Avoid wetlands.
7. Avoid archaeological sites and historic structures listed on or eligible for listing on the National Register of Historic Places.
8. Consider a joint use facility (one the department and another entity share) as an alternate, if one is feasible.
9. Generally, do not consider an option that requires water quality monitoring. Historically this has been very expensive.
10. Stormwater treatment systems must be at least 30 meters (100 feet) from any public water supply well. (Chapter 62-555, F.A.C.)
11. Locations with billboards are usually expensive.

The right of way required for a stormwater management system site varies with the amount of additional impervious area and associated additional runoff, the ground line and ground water elevations at the site, the proposed road elevations, and sometimes soil conditions and other factors.

Right Of Way Acquisition

Once the stormwater management system site has been identified the FDOT Office of Right of Way's acquisition program is responsible for acquiring the property needed by the department. Soon after owners are identified and appraisals are prepared, negotiations will begin. Negotiations for the purchase of private property are conducted in strict compliance with both federal and state law. Property owners are notified of their rights prior to, or at the time the department delivers its offer to purchase. The amount of the offer will not be less than the department's estimate of the value of the property being acquired. Owners are guaranteed no less than 30 days from the time the offer is made to consider the offer before an eminent domain suit will be filed. The department will pay the owner's reasonable cost for an attorney to represent them during negotiations and for appraisal and other experts necessary to establish the value of their property. If an agreement is reached, department acquisition staff will coordinate or conduct the real estate closing. The department will pay all closing costs associated with the title transfer.

If the department and the property owner cannot agree on the price to be paid for the owner's property, the department may choose to file an eminent domain suit to acquire the property. Throughout the litigation process the department will continue to negotiate with the land owner and their attorney. If agreement can be reached, the litigation will be ended and the agreed amount will be paid. Ultimately, if the owner and the department cannot agree, a jury may decide the amount the department must pay for the acquired land. The department will pay all property owners expenses for an attorney and other necessary experts throughout the condemnation process.