2A-1 General Information

A. Concept

This section sets forth concepts for stormwater management objectives. Principal design considerations should be the prevention of damage to the development site, streams, drainageways, streets, public and private property, and to the reduction of soil erosion. Emphasis should be placed on detention, storage, and the use of other Best Management Practices to manage rainfall with a goal of not increasing erosion, sedimentation, or the discharge rate downstream from that existing prior to development. The Project Engineer is encouraged to use cost-effective designs that are hydrologically and hydraulically appropriate through the use of good engineering judgment.

Post-developed peak runoff is expected to exceed pre-developed runoff from a similar storm event. Even if calculated time of concentration or curve number tables suggest lower post-developed runoff, developed sites generally have more impervious areas, compacted soils, and shallow root vegetation than undeveloped sites. There are exceptions, such as an existing hard-surfaced site re-developed with more green space. Careful consideration of the design method and engineering judgment are necessary to ensure calculated results match expectations.

B. Conditions

1. Design data provided by the Project Engineer should demonstrate that investigations include:

    a. The function of the streets as part of the storm water system, including level of anticipated flooding of street surfaces and encroachment into driving lanes.

    b. Gutters and intakes are adequate to prevent excessive flooding of streets and right-of ways.

    c. Culverts and storm pipes are designed to sufficient size.

    d. Adequate overland relief with proper easements for storms larger than the design storm.

    e. Street grades are coordinated with lot drainage; lot drainage slopes will not be less than 1-1/2% to minimize ponding, and not excessive to cause uncontrollable erosion.

    f. Spot elevations should be listed at each rear lot corner, at the mid-point of the side yard line, and along the proposed drainage ways and easements.

2. The Project Engineer should evaluate drainage alternatives to handle the runoff and select the optimum design that will strike a balance between initial capital costs, maintenance costs, and public protection. Consideration should also be given to safety, environmental protection, and maintenance of the drainage system. Care should be exercised in developing drainage systems that depend solely on a specified protection level. Designers need to keep in mind that rainfall and runoff events seldom, if ever, occur at a specified frequency or duration. Therefore, at critical locations, additional protection should be considered, depending upon the drainage basin characteristics and the degree of protection necessary downstream.

   The following are examples that include but are not limited to, situations where damage can occur on the specified design frequency and duration in which emergency spillways or outlets are not made available.

   - Drainageways between buildings such as housing and in backyards.
   - Enclosed storm sewers adjacent to private property, where a single inlet could be plugged, resulting in significant damage to adjacent property.
   - Single-lot or multiple-lot storm water detention.

3. In addition to the potential damage in these particular areas, maintenance of the stormwater conveyance needs to be considered. Private-owner or homeowner association maintenance has the advantage of simplified responsibilities, without direct cost to the general taxpayer. The disadvantage is when the homeowner or association is not capable of maintaining a stormwater system on a continuous basis. Other options to be considered are delayed transfer of ownership from builder to homeowner's association, to ensure proper stormwater conveyance system operation; or the issuance of a performance or maintenance bond by the builder, valid for a specified period of time. When the stormwater conveyance system is significant enough that the normal individual or group of individuals does not have the means for continuous maintenance, other maintenance alternatives need to be developed that involve Jurisdiction-owned facilities. This would involve construction and maintenance by the Jurisdiction, funded through:

   - A one-time charge to the developer that is placed into a stormwater escrow account for immediate or future stormwater improvements.
   - A stormwater utility assessment (either a one-time lump sum or monthly charge).
   - Construction of the stormwater facility by the developer that would be owned and maintained by the Jurisdiction.

4. Runoff analysis should be based upon proposed land use, and should take into consideration all contributing runoff from areas outside of the study areas.

5. All undeveloped land lying outside of the study area should be considered as fully developed based upon the Jurisdiction's comprehensive plan. The project designer should check with the Jurisdiction regarding upstream conditions.

6. If future land use of a specific undeveloped area is unknown, the runoff coefficient should be established on a conservative basis. The probable future flow pattern in undeveloped areas should be based on existing natural topographic features (existing slopes, drainageways, etc.). Average land slopes in both developed and undeveloped areas may be used in computing runoff. However, for areas in which drainage patterns and slopes are established, these should be utilized.

7. Flows and velocities that may occur at a design point when the upstream area is fully developed should be considered. Drainage facilities should be designed such that increased flows and velocities will not cause erosion damage.

8. The primary use of streets should be for the conveyance of traffic. The computed amount of runoff in streets should not exceed the requirements set forth herein.

9. The use of detention and natural drainageways is recommended and encouraged whenever possible. The changing of natural drainageway locations may not be approved unless such change is shown to be without unreasonable hazard and liability, substantiated by thorough analysis and investigation.

10. Restrictive covenants, surface flowage easements and impoundment easements may be required to be executed and recorded to provide for the protection and maintenance of grassed drainage swales and grassed drainage detention areas within build-up areas.

    If the Jurisdictional Engineer's approval is given to the use of natural ditches, the Project Engineer should show that the project will have minimum disruption of the existing environment and covenants may be required to be executed and recorded to provide protection. The Jurisdictional Engineer may allow changes in the ditch, provided state and federal guidelines and regulations will be followed.

11. In the design of storm drainage systems, consideration should be given to both surface and subsurface sources. Subsurface drainage systems should be designed where required. The discharge from such underdrain systems should not flow over sidewalks or onto streets after completion of the project.

12. Land grading of the project site should be performed to take advantage of existing contours and minimize soil disturbance. Steep slopes should be avoided. If steep slopes are necessary, an attempt should be made to save natural grasses, shrubs, and trees on these slopes and re-establish ground cover and permanent erosion control measures as soon as possible.

13. During construction grading phases, temporary diversions, contour furrows, terraces, and other remedial conservation practices should be used to reduce erosion and excessive water drainage to downstream adjacent properties. Sediment traps and basins should be used at the lower end of the drainageways and provisions should be made for their maintenance.

    An erosion control plan should be developed according to the guidelines of the "Iowa Construction Site Erosion Control Manual," Cable, 1994. Acquire stormwater discharge permits from the Iowa Department of Natural Resources (www.iowadnr.com) for construction sites exceeding one acre in area.

14. The planning and design of drainage systems should be such that problems are not transferred from one location to another. Outfall points and velocities should be designed in such a manner that will not create flooding hazards downstream.

15. Where a master drainage plan for a Jurisdiction is available, the flow routing for both the minor storm and major storm runoff should conform to said plan. Drainage easements conforming to the master plan will be required and should be designated on all drainage drawings and subdivision plats.

16. Any proposed building or construction of any type of structure including retaining walls, fences, etc., or the placement of any type of fill material which will encroach on any utility or drainage easement, requires written approval of the Jurisdiction. Such structure will not impair surface or subsurface drainage from surrounding areas.

17. The design for stormwater management facilities should be in conformance with the following:

    a. Requirements and standards of the Iowa Department of Natural Resources (IDNR) and Environmental Protection Agency (EPA).

    b. Urban Design Standards and Urban Standard Specifications for Public Improvements.

    c. Jurisdiction Plumbing Code.

    d. In case of a conflict between the above design standards, the most restrictive requirement should apply.

18. Construction standards should be the most recent revision of the Urban Standard Specifications for Public Improvements together, with the latest addenda. All details, materials, and storm sewer appurtenances should conform to these standards.

19. The Environmental Protection Agency (EPA) approved the Final Stormwater Rule under the National Pollutant Discharge Elimination System (NPDES). Under this rule, qualified projects are required to have stormwater discharge permits. See Chapter 7, Section 3 for specific details regarding the permit requirements.

C. Unified sizing criteria

This subsection is currently under development.

D. Floodplain management

1. Although not a direct element of the municipal stormwater conveyance design, floodplain management should be considered along with the overall stormwater management plan to manage the floodplain as it relates to the various stormwater conveyance means, pipes, culverts, streams, and open channels.

2. According to *Municipal Stormwater Management, Second Edition*, "This duty (to manage the floodplain) is assigned by virtue of need and federal, state, and local regulations. The Floodplain Management Act of 1978 requires the floodplain manager to perform a number of duties."

   Furthermore, it states, "FEMA (1986) provides an overview of the pertinent details of floodplain management and provides a conceptual framework for floodplain management that stands on four important legs:

   a. Reduce flood losses and threats to health and safety.

   b. Preserve and restore the natural and beneficial uses of floodplains.

   c. Take a balanced view that minimizes exposure to loss rather than one that promotes either floodplain abandonment, or intense floodplain development.

   d. Develop and use the tools available to provide careful and technically sound consideration of all information and alternative uses of floodplains.

   Floodplain management, when integrated with the overall stormwater management program, provides a regulatory means to improve the surface water system throughout the municipality."

3. **Certification**

   a. The Association of State Floodplain Managers (ASFPM) has established a national program for professional certification of floodplain managers.

   b. The ASFPM is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery. ASFPM represents the flood hazard specialists of local, state and federal government, the research community, the insurance industry, and the fields of engineering, hydrologic forecasting, emergency response, water resources, and others.

   c. The primary goal of the ASFPM Certified Floodplain Manager Program (CFM Program) is to help reduce the nation's flood losses and protect and enhance the natural resources and functions of its floodplains by improving the knowledge and abilities of floodplain managers in the United States.

   d. The certification is given by ASFPM chapter, state, or regional associations, and accredited state agencies, such as the Iowa Department of Natural Resources. More information about the Association of State Floodplain Managers and the Certified Floodplain Manager Program can be found on its website: www.floods.org.