APPENDIX F - CITY OF FRANKLIN STORM WATER DETENTION/RETENTION BASIN LANDSCAPE GUIDELINES

THE CITY OF FRANKLIN
STORM WATER DETENTION/RETENTION BASIN
LANDSCAPE GUIDELINES

DRAFT
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Storm Water Detention/Retention Basin Landscape Guidelines
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INTRODUCTION

The City of Franklin is experiencing rapid growth and development. The changes have altered the natural flow of water in the city and have greatly increased non-permeable surfaces such as parking areas, roofs, and roadways. Runoff from these non-porous surfaces produces an increase in the volume of polluted storm water. When not properly managed, runoff can lead to erosion along with flood damage to homes and property. Preventing over development with ecologically sound environmental practices is critical as Franklin rapidly grows and develops, so that our wetland areas are able to continue to naturally purify our water and maintain our quality of health and well being.

Management of increased storm water runoff caused by urban development is an essential part of flood control and water quality protection. The City's natural drainage waterways provide filtration of pollutants, wildlife corridors, and natural beauty. While these waterways have played an important role in protecting the health and welfare of citizens, they have added desirable aesthetic features and economic value to the City. Now more than ever, they need protection as their outstanding benefits are being threatened with continued heavy sediment/pollution loads or extreme water level changes.

Wetlands can tolerate only a certain amount of nutrient loading from soil erosion and phosphorus loading from runoff before they reach their "assimilation capacity". A number of wetlands in Franklin have already reached their assimilation capacity. This is evident by the presence of a single plant species, such as cattail, which can tolerate higher pollutant levels.

THE INTENT

't is the intent of the City of Franklin to provide the most effective means of protecting water quality and avoid further degradation by implementing the Storm Water Management Landscape Guidelines (SWMLG) for storm water detention/retention basins. The City of Franklin intends to augment standards for storm water basins by increasing the quality of storm water runoff to levels that are equal to or exceed the levels that existed prior to development.

Guidelines for vegetative buffers will aid the City, developers, and homeowner associations, by the installation of proper landscape filtration systems around ponds in accordance with ecological plant community principles. Natural landscape buffers provide a very effective method to trap pollutants and maintain a more natural landscape. Setting minimum plant quantities results in greater species diversity, increased wildlife habitat, color, and beauty, while providing water temperature control and filtration. In addition, maintenance costs will be reduced. *Bonestroo, Rosene, Anderlik and Associates*, a consulting firm hired to prepare the City's storm water management plan, introduced the concept of designing water quality ponds with vegetative buffers as early as 1993. Implementation of this concept will aid the City to maintain water quality, control sediment and erosion, and reduce costs of maintenance.

THE PURPOSE

1. To protect the public's health, safety and general welfare.

2. To provide a more natural appearance to basins, which also will aid the environment's ecological balance, contribute to the ground water recharge process, filter storm water pollutants, and increase overall water quality.

3. To encourage aquatic and wetland plant species to act as buffer zone areas that will assist in effective removal of soluble pollutants while promoting wildlife habitat.

4. To prevent the need for the short term solution of expensive chemical treatments in order to control over-production of algae and undesirable plant life.

5. To preserve and protect unique environmental characteristics of an area to encourage balanced populations of waterfowl and wildlife versus over population of a single species.

APPROVAL PROCESS

To ensure that the purpose and intent of the SWMLG are fulfilled, all development properties which requiring SWM basins or detention/retention ponds shall submit a SWMLG plan to the city. The Environmental Commission recommends the development of a SWMLG plan by a certified wetland consultant who has knowledge in botany or who is a registered landscape architect. A botanist can ensure that all selected plants are approved species. The plan will then be reviewed by the Planning and Engineering staff followed by a recommendation of the Environmental Commission. If it appears as if all requirements are being met satisfactorily, the SWMLG plan may be presented to the Common Council for final approval.

PLAN REQUIREMENTS

1. Before the start of any work regulated by this provision, an applicant shall comply with all submittal procedures and provisions of the UDO including: buildings and zoning permits, inspections, development agreements and similar matters along with those set forth in this provision as regulated by the Franklin Municipal Code, all other applicable ordinances, and guidelines adopted by the City.
2. The provisions and regulations contained in this provision shall be used as guidelines and be applicable to the development, and improvement of all lots, blocks, tracts and parcels of land over which the City has jurisdiction to regulate. Those matters which are not specifically regulated or controlled by the provisions are contained in the Zoning Codes, Erosion Control Ordinance, Subdivision Codes, Unified Development Ordinance and Building Codes.
3. Plant species selected shall be listed by both common and scientific name and reviewed by a person knowledgeable in botany or wetland plant communities or a wetland consultant. This person's name shall be listed on the landscape plan next to the signature of the registered landscape architect or certified landscape architect.
4. A registered landscape architect, botanist or certified wetland specialist who is knowledgeable in storm water basin planting design and local vegetation, and who has a minimum of two years experience, must certify/seal the plan as complete and accurate and in compliance with the requirements of this provision. The requirement that an experienced professional certify such plans and specifications may be waived for minor alterations and improvements.
5. Following the installation, a registered landscape architect, a certified wetland consultant or botanist, shall provide written, certification that all required landscape material has been installed in conformance with the SWML plan, which received final approval from the Common Council.

PROCEDURES

1. In preparation for a SWMLG site plan review, the site plan shall contain landscaping information in accordance with this provision and the City's minimum requirements for site plan information. All storm water basin landscape plans must include the following information:

    A. The location and dimensions of all existing tree lines, woodlands, natural resource features, proposed structures, parking lots, drives, roadways, right-of-ways, sidewalks, bicycle paths, ground signs, refuse disposal areas, bicycle parking areas, architectural features, utility equipment, utility easements and lines (above & below ground), conservation easements, including wetlands, and floodplains, lighting, wells and private sewerage disposal facilities.

    B. A plant schedule including the location, quantity, and names (both scientific and common) of all existing vegetation that is to remain and that will be installed, the size at the time of planting, root condition, spacing of perennials, grasses, and shrubs including the seeding mixtures and source, rates, method of seedbed preparation, expected seeding and/or planting dates.

    C. Topographical plans of the property to be developed indicating, at two (2) foot intervals, the location of all proposed berming and percent of slope, ground elevation

contours and storm water basin cross sections.

D. A general description of the predominate soil types within the storm water basin areas to a depth of intended excavation, their location, and their limitations for the proposed use.

E. All floodplain, floodway, navigable waterways or wetland delineation accepted or recognized by theCity, shall be clearly shown on all preliminary plans, subdivision construction plans, final plats or certified survey maps submitted for approval.

F. In addition, all plans must include the following information:
   1. North arrow
   2. Scale
   3. Name of Owner
   4. Project Location
   5. Name of Project
   6. Date of Plan
   7. Section number
   8. Credentials and name of both the Landscape Architect and the reviewing Botanist (or Wetland Consultant) along with the date of approval of the plant/seed selection list by an experienced Botanist.

2. The City of Franklin Engineering Department or persons directed by Engineering Department shall inspect each site to ensure compliance with this provision. Prior to final landscape inspection, a sealed letter of concurrence shall be provided to the Engineering Department from a registered botanist, or landscape architect representing the development, which shall verify that the project has been implemented in accordance with the City's approved plans, and is in full compliance with this provision.

3. Prior to issuance of an occupancy permit for non-residential developments, all dry bottom storm water storage areas (detention basins), wet bottom storm water storage areas (retention basins), and swales must be functional and completely landscaped as per the approved plans. All work must be completed within twelve (12) months of the signing of the subdivider's or development agreement.

EXEMPTIONS

Except as otherwise provided below, this provision shall apply to all land located in the City's zoning jurisdiction.

1. A common development, which includes more than one lot shall be treated as one lot for the purposes of this provision. Split ownership, planning in phases, construction in stages, or multiple building permits for a project shall not prevent it from being such a common development. Each phase of a phased project shall comply with this provision. This provision shall not apply to the following:

   A. Single-family residences where only one structure is constructed on a previously platted lot or under ½ acre of non permeable surface.

   B. Substantial restoration which occurs within a 12 month period of a building damaged by fire, explosion, flood, tornado, riot, act of the public enemy, or an accident of any kind.

   C. Restoration of buildings with a historic designation.

   D. Interior or facade remodeling as long as the building's front and side exterior walls

remain in the same location.

F. All development having an approved final plat or CSM prior to the date of this ordinance insertion or any item covered under the grandfather clause of the City's UDO.

2. Developed property or platted lots of record which are impacted by a subsequent right-of-way condemnation may be developed without strict compliance with the requirements in this provision under the following provisions:

A. Modified Landscape Plan improvements (structures and related facilities shown on the remainder of the platted lot after condemnation has occurred) may be constructed after approval by the Plan Commission.

B. Improvements on developed property lost through the right-of-way condemnation may be replaced elsewhere on the remaining lot. Only the area contained within the new limits of construction for the recaptured improvements shall be required to comply with the requirements of this provision.

ALTERNATIVE COMPLIANCE

Notwithstanding the foregoing requirements of this provision and in unusual situations where a hardship would be created, a landscape plan which proposes an alternative to strict compliance with the various landscape requirements in this provision may be approved by the Common Council with approval of the City Engineer, Plan Commission, and a written recommendation from the Environmental Commission, or experts referred by the Environmental Commission, if the Council finds that such a plan adequately achieves, or is an improvement on the intent of the landscaping requirements for protection of water quality in this provision.

EXISTING WOODLAND AND TREE PRESERVATION

Preferential consideration shall be given to the preservation of large existing native trees and vegetation in or near the required landscape areas.

Many woodlands and trees that are growing in Franklin have been here for generations. These resources shall be preserved to the maximum extent feasible for the education, and enjoyment of future generations. Designation of Woodlands and trees to ensure that they survive grading and construction procedures require special attention. As outlined in the resource protection standards and the grading sections of the Unified Development Ordinance (UDO), those trees designated to be preserved shall be clearly shown on the plans and special attention shall be given to them at the time of construction. These areas must be unmistakably identified in the field as an area of "no disturbance", so that it is obvious to all equipment operators and other construction personnel that care shall be taken to avoid damage. Harmful practices such as grading or trenching within the area, placing backfill near trees, driving or parking equipment in preservation areas and dumping trash, oil, or paint within the vicinity is prohibited and enforceable by Inspection Services.

FISCAL SECURITY

At the time of site plan approval the City staff shall recommend to the Plan Commission that the owner make a fiscal arrangement either by bond, certificate of-deposit, or letter-of-credit with the City, to ensure that the owner is in full compliance with landscape installation and maintenance requirements.

To assure compliance with the landscape installation requirements, a fiscal security may be required when an approved plan is executed in an amount calculated in accordance with the rate set forth in this provision. The fiscal arrangements shall reflect the cost of required landscaping, including preparation and installation of plants and plant beds. Additionally, a maintenance bond may be required to assure that young landscapes are maintained during their critical establishment period (three years) following installation. The maintenance bond amount will be calculated in accordance with the rate set forth in this provision.

Any owner must also grant a temporary access easement and license to the City, or its licensed contracted agent, in order to enter the land for the purposes of installing the required landscaping during the time of the maintenance compliance, which is typically three years In the event that such landscaping is not in place by the date specified in the agreement, necessary fiscal arrangements shall be released when landscape improvement verification is received. Should the City have to provide for full compliance, the applicant will then forfeit the fiscal security deposit.

1. Installation Compliance Security -A fiscal arrangement in the amount of $85.00/100 sq. ft. (where square feet is the total area of influence) may be included, as a segregated line item, as part of the letter-of-credit required by the City for all residential and non-residential developments.

2. Maintenance Compliance Security -A fiscal arrangement in the amount of $15.00/100 sq. ft. (where square feet is the total area of influence) may be included, as a segregated line item, as part of the letter-of-credit required by the City for all residential and non-residential developments.

LANDSCAPE REQUIREMENTS

Storm water basins, whether they function as retention or detention basins, all have a zone of influence, (i.e. a series of concentric bands or planting zones), where various physical and environmental components such as soil type, water depth, water fluctuations, velocity, and slope, collectively and/or individually influence the degree to which plants will tolerate such conditions and thrive.

The intent of landscape requirements is to assure that appropriate plant species are incorporated into the storm water basin landscape design. Each planting zone or band requires its own plant type in order to properly perform its mutually critical role. Requirements are based on:

- The plant's specific niche in the storm water runoff system.
- The minimum percentages of plant types required to provide a diverse plant community.
- Creating a naturally appearing basin in the urban landscape.
- Developing an asset in the landscape, which enhances safety, prevents nuisances of over abundant waterfowl, such as geese.
- The ability to filter excess nutrients and non-point source pollution in order to improve water quality.

PLANTING ZONES

The landscaping and engineering of storm water basins can range from the very simplistic with 'volunteer' vegetationto a sophisticated natural system which utilizes forebays, weirs, peat berms, etc. It is emphasized here, that a basin will provide increased water quality benefits when consideration is given to site specific, accurate analysis of the soils, natural resource features, plant species selection, maintenance, microclimate, velocity etc., during the design process.

For the purposes of determining landscape strategies for Franklin's storm water basins, these standards utilize an abbreviated concept of concentric bands, or rings, which together make up a basin's "zone of greatest influence". Each zone has its own requirements. The Retention and Detention Zones are:

1. The Emergent Zone - Retention Basins
2. Shoreline Zone - (Upper and Lower)- Retention Basins
3. Upland Buffer Zone – Retention/Detention Basins

4. Bottom Zone - Retention/ Detention Basins
5. Fringe Zone - Detention Basins
6. Low Flow Channel - Detention Basins

Because of their function to permanently retain pools of water, Retention basins are the more dynamic of the two basin types. Their Emergent and Shoreline zones are vulnerable to water and wind fluctuations requiring a diverse mix of tenacious plant types. The Emergent Zone makes use of *emergent aquatic plants* in the shallow water areas or along the shoreline. They grow above the water, rooted in soils near or under the water. The plants are usually rigid in structure and capable of withstanding considerable water saturation as they possess high filtering capabilities. On the other hand, Detention basins are designed to remain d dry for longer periods of time. As different as they are, they do share common plant species.

RETENTION BASIN LANDSCAPE REQUIREMENTS: (ALWAYS WET)

The following are the planting requirements for the zones comprising retention basins. See attached Retention Basin illustration in the back of the guidelines. The planting zones for Retention basins are:

1. Bottom Zone
2. Emergent Zone
3. Shoreline Zone – Upper and Lower
4. Upland Buffer Zone

1. **Bottom Zone Requirements:**
This zone of a retention basin is generally the 1'-6' deep permanent water holding area. Vegetative cover is unnecessary. However, volunteer plants will tend to establish themselves through natural succession.

2. **Emergent Zone Requirements:**
Sometimes referred to as the safety shelf and located along the perimeter of the pool 10' inside the normal water level. Generally, it does not exceed 10% slope. Emergent aquatic plantings are required. No woody shrubs shall be planted within this zone. The Emergent Zone must meet the following requirements:

   A. Either Stone rip rap (washed stone 3"-6") or Fabric encapsilated soil (FES) is acceptable, yet shall not exceed 30% of the total Emergent Zone area, and is preferably located within the maintenance access area.

   B. The required emergent aquatic vegetation (minimum 70% of the area) shall be specified at the following rate in item C below.

   C. Aquatic-Emergent (AQE) plantings in the form of plugs, pods or drifts shall be incorporated to cover 70% of the Emergent Zone at a ratio of one plant per square foot (about 2000 plants for the emergent zone of a 10-foot area inside a 1-acre pond).

3. **Shoreline Zone Requirements for both Upper and Lower sections (wet meadow grading into upland):**
The Shoreline Zone, generally flat or gently sloping, is measured from the normal water level upslope 10 feet at a 10:1 slope. The Shoreline Zone vegetation is important for removal of non-point source pollutant runoff, sedimentation, and as a deterrent to waterfowl from leaving the water area. The Lower portion or the first 5-ft. of the Shoreline Zone, (depending on the slope), will require a more wet mesic seed mix than the upper portion. This is due to the transition zone from the wet basin edge to the upslope portions of the Shoreline Zone. One hundred percent (100%) of the Shoreline Zone shall be seeded and/or planted at the following rates and meet the following requirements:

   A. Seeding *: Wisconsin species grasses and sedges shall be seeded at a rate of 8-lbs/acre with a minimum of four (4) species. Forbs shall be seeded at 8-lbs. per acre, consisting of a minimum of 24 species. Acceptable seed mixes include local species of prairie grasses, sedges and forbs found within a 150-mile radius of the City of Franklin and selected to meet soil conditions of the

site. For faster results and immediate show, individual plants may be used at a rate of one per 4-sq. ft. in place of seeding. Cover crop shall be seeded at twice the rate of the native seed mixture. Cover crop shall be used to over-seed both planted and seeded areas and shall contain 3-4 annual species, such as flax, buckwheat, rye and oats.

1. Annual rye, *Lolium multiflorium*, shall be the species used when included into the cover crop, as it will not persist beyond one growing season. Perennial Rye, *Lolium perenne* persists for several years competing with desirable species. Grain rye, *Secale* species, shall not be used due to its allelopathic nature. For best results and weed competition advantage, the breakdown of species for flowering forbs shall include about 12% legumes, 12% spring flowering. 20% summer, 30% fall and 26% early succession or quick start species, in addition to the native grasses, sedges and annual cover crop.

B. Shoreline Zone Optional Design: Maintained turf areas (such as Kentucky Blue Grass) may be used to allow vehicle access for maintenance such as, but not limited to, dredging equipment. When using turf in the Shoreline Zone, the turf area shall not exceed 30% of the total area, and shall be designed in such a way to be located within the area of maintenance access as well as in-line with turf area of any upper turf zones. Creeping turf grasses shall be avoided to prevent the spread into native areas.

1. One "perched" tree may be installed within the Shoreline Zone if desired. This species shall be a Wisconsin species and tolerant of moist soil conditions.

4. Upland Buffer Zone Requirements:

Located 10-25 feet upslope (depending on the slope) from the Shoreline Zone, where environmental conditions are more stable, trees and shrubs are introduced as a buffer and transition to the surrounding landscape. Greater turf grass is allowed in portions of this area, however, within this zone the following is required:

A. Deciduous trees: At least one deciduous tree no less than 2" caliper shall be incorporated into the design, native species preferred, and included as part of the installation per the following ratio:

1. One 2" caliper tree per 6000/sq. ft. of total Upland Buffer Zone area. The first which is preferred as a Wisconsin native species. Note* Norway Maples are being considered as a noxious tree in many states and are being considered for removal from the City of Franklin's acceptable tree list.

B. Evergreen trees: Evergreens may be incorporated into the design within the Upland Buffer Zone. When Evergreens are used they shall included at least one 6' high evergreen native to Wisconsin. The location of the tree (s) shall be toward the outside, within the last 5-ft of the Upland Buffer Zone. Installation shall be per the following ratio:

1. One 6' evergreen tree per 2000 sq. ft of total Upland Buffer Zone (one of which shall be a Wisconsin species). All evergreens shall be located within the outside 5-ft. of the Upland Buffer Zone.

C. Shrubs: A combination of deciduous shrubs must comprise a minimum 10% coverage area of the total Upland Buffer Zone. Evergreen trees do not contribute to the 10% coverage area. Shrubs shall be non-aggressive species and Wisconsin native species are preferred.

D. Ground Cover Vegetation: Historically, maintained turf has been the choice for ground cover vegetation. However, a natural prairie, or native species ground cover is the preferred choice when developing a more natural appearance to the basin in addition to providing better filtration and a deep root system for soil stabilization.

1. A minimum of 70% of the Upland Buffer Zone shall be planted in a native seed as outlined in under Shoreline Zone Section 3 (A, B), Seeding. Individual plants may be used at a rate of one per 4 sq. ft. with over seeding and a cover crop.

E. Maintained Turf Areas: Turf, such as Kentucky Blue Grass, shall not exceed 40% of the total Upland Buffer Zone. When using the optional shoreline design, the turf area of the Upland Buffer Zone shall be in-line with the 40% turf area of the Shoreline Zone. In addition, all turf areas shall be in-line with the access area that will allow for future maintenance of the basin. Seed maintained turf at the rate of 4-lbs/1000 sq. ft. or at the usual turf grass seeding rate.

DETENTION BASIN LANDSCAPE REQUIREMENTS

The following are the planting requirements for the zones comprising detention basins. See attached Detention Basin illustration at back of guidelines. The planting zones are:

1. Low Flow Channel
2. Bottom Zone
3. Fringe Zone
4. Upland Buffer Zone

1. Low Flow Channel Zone Requirements:

Water tolerant plants and/or seed shall be installed within the Low Flow Channel that typically runs from the inlet to the discharge drain, or lowest point of the basin. This area is most apt to hold water for the longest duration of time following a heavy storm. Native, perennial flowering forbs, sedges, grasses, or stone rip rap can be used within this channel, including the areas surrounding both inlet and discharge drains , except as a force-dissipating feature at the inlet pipe or structure. If woody plant material is to be installed in the Low Flow Zone, they must be selected to tolerate intermittent flooding. The Low Flow Channel shall be a minimum 3' wide and meet the following requirements:

A. Ground Cover Vegetation: Wisconsin water tolerant flowering prairie forbs, sedges and grasses shall be specified with a cover crop. Seed or plant at the rates specified under Retention Shoreline Zone Section 3 (A, B) Seeding.

B. Inlet & Discharge Drains: Perennial sedges and/or a mixture of native grasses shall be specified around the drains to a minimum distance of eight (8) feet. Seed mixture shall be of native sedges and grasses suitable to soil conditions at a rate of 16-lbs per acre with a multi-species cover crop as outlined under the Section 3 (A, B) Seeding. Flowering forbs are not required but are not prohibited in the Inlet or Discharge areas.

2. Bottom Zone Requirements:

Surrounding the Low Flow Channel, is the Bottom Zone that is generally flat, and occasionally inundated. Water tolerant plants and/or seed suitable for occasional wet conditions, from a 150-mile radius of Franklin shall cover 100% of the bottom zone. Refer to the Retention Shoreline Zone Section 3 (A, B), Seeding.

3. Fringe Zone Requirements:

The Fringe Zone is measured from the outside edge of the Bottom Zone out 15-ft. and is subject to periodic inundation. The Fringe Zone must meet the following requirements:

A. Trees: One minimum 2" caliper deciduous tree is required for every 6000 sq. ft. of total Fringe Zone area. Wisconsin native species are preferred. For Fringe Zones that are less than 6000 square feet, a minimum of one tree shall be planted. Evergreens may be used after meeting the requirement for one deciduous Wisconsin species. All species must be tolerant of periodic inundation.

B. Shrubs: Deciduous or evergreen shrubs, minimum 24" high, must cover 10% of the total Fringe Zone. Non-aggressive native Wisconsin species are preferred. All species shall be selected to be tolerant of periodic wet conditions.

C. Ground Cover Vegetation: A minimum 70% of the Fringe Zone area shall be planted in a native seed mix. The Fringe Zone shall include a combination of four (4) grass and sedge species sown at 8-lbs/acre, and forbs of at least twenty-four (24) species sown at 6-8lbs/acre. A cover crop shall be used in the interim, prior to seed germination, as outlined in the Retention Shoreline Zone section 3 (A, B).

1. Maintained turf areas shall not exceed 30% of the total Fringe Zone area and should be seeded at 4-1bs/1000 sq. ft. or at manufactures suggested turf seed rate.

4. **Upland Buffer Zone Requirements:**
Located 15' outside the Fringe Zone, trees and shrubs are more prevalent. The Upland Buffer Zone serves as a transition into the development's overall landscape theme, and as a buffer to adjacent land uses. Within this zone, the following is required:

A. Deciduous trees: At least one deciduous tree no less than 2" caliper shall be incorporated into the design and included as part of the installation per the following ratio:

1. One 2" caliper tree per 6000/sq. ft. of total Upland Buffer Zone area.

B. Evergreen trees: The location of the tree (s) may be used anywhere within the Upland Buffer Zone. At least one Wisconsin native evergreen 6' high tree shall be incorporated into the design and included as part of the installation per the following ratio if evergreens are used in this area:

1. One 6' high evergreen tree per 8000 sq. ft of total Upland Buffer Zone.

C. Shrubs: A combination of Wisconsin species deciduous and evergreen shrubs, no less than 24" high (at time of planting) must comprise a minimum 10% coverage area of the total Upland Buffer Zone.

D. Ground Cover Vegetation: A natural seed mix is the preferred choice of ground cover. However, maintained turf may be used. Sow native seed per Retention Shoreline Zone Section 3 (A, B), or 4-lbs/1000 sq. ft for maintained turf.

EXEMPTIONS

Where slopes are in excess of 3:1, maintained turf is not permitted.

LANDSCAPING DESIGN CONSIDERATIONS AND GOALS

The design of an effective and diverse storm water basin requires a sophisticated understanding of hydrology, wetland plant ecology, upland native prairie species, and the important functions they perform. Clearly, storm water management requires an interdisciplinary approach during both design and construction. It is encouraged and useful to establish a design team early in the planning process that includes a botanist, a wetlands expert, a landscape architect, engineers and contractors to make sure that the final design is both effective and practical.

Storm water basins if designed properly, are beneficial water treatment systems. Their design achieves the major objectives of effective storm water management while they aesthetically comply with the community's respect for environmental sensitivity. The essential design considerations and goals of a quality storm water basin are to:

1. Capture and effectively treat over 90% of the storm water runoff volume produced by the urban

development.

2. Pre-treat the storm water run off before it reaches wetland areas so as to reduce the water velocity and trap coarse sediments.
3. Create a diversity of depth zones within the basin to meet the unique growing requirements of emergent wetland plants.
4. Establish a diverse and dense plant community in the shortest possible time.
5. Create a functional landscape within the zone of influence of the storm water basin that augments pollutant removal to create better wildlife habitat and to promote a more natural appearance.
6. Reduce the future maintenance burden of the storm water basin through preventive management to protect its long-term function.
7. Provide habitat elements that promote greater wildlife and waterfowl use within the basin's zone of influence while avoiding undesirable habitat outcomes.
8. Serve as an attractive yet safe community asset.
   Utilize the space necessary for the development of a Stormwater basin to maximize the area's recreational potential. Trees, wildflowers, and paths around a storm water basin act as an attractive place to walk, bird watch, or picnic.

RETENTION BASINS

Storm water retention basins (ponds) are an important necessity to remove pollutants from urban storm water runoff. They perform this by holding storm water long enough to allow sediments to settle out of the water. Because many pollutants are attached to sediment particles, they settle out with the sediment. Microorganisms and plants that live in the retention basins remove additional dissolved pollutants. Maintenance should be considered at the time of designing a storm water pond. To make maintenance easier and less expensive, ponds should include the following features:

1. A discharge drain made of concrete or other durable materials other than corrugated metal riser pipe.
2. A discharge drain located in the embankment with access for repair and debris removal .
3. A disposal site near the pond for dredge spoils.
4. Shoreline protection to prevent erosion from the wave action.
5. Facilities to allow the pond level to be lowered by gravity flow for cleaning purposes and shoreline maintenance.
6. Aeration facilities can be used to prevent pond stagnation, however, this will diminish necessary settlement of sediment.
7. Protection of natural vegetation wherever possible. Areas immediately adjacent to natural watercourses should be left undisturbed.
8. Plant selections that consider climate and other events likely to contribute to erosion, based on an evaluation of the risks, costs and benefits involved.
9. Aesthetics, public health and the requirements of continuing maintenance should be considered in the planting design of the storm water basins.
10. Appropriate notice signs, as approved by the City of Franklin, should be posted.
11. Encourage walkways, bike path, jogging trails etc. around the outer basin zones to maximize the open space uses through the establishment of public use and access easements.
12. Forebays and sedimentation basins shall be design features whenever possible.

Safety:

Safety is a vital element of storm water retention basin design. All basins should include:

1. Gentle side slopes
2. A safety shelf around the edges of the retention basin
3. Emergent plantings on the safety shelf (Emergent Zone)
4. No swimming or fishing signs as mandated by the City

Landscaping:

Proper landscaping enhances retention basin safety, improves pollutant removal, discourages waterfowl from leaving the water and becoming a nuisance, and provides attractive open space. A typical landscape plan should address the

concentric rings of vegetation around the basin. Of high importance is the Emergent Zone, where rings of wetland plants such as bulrushes emerge from the shallow water within the safety shelf.

A ring of sedges, and other plants adapted to wet conditions should be planted along the shoreline for a natural appearance as well as for the additional benefits they provide. In areas providing access for maintenance or dredging easements turf may be used. Yet it is encouraged that it be used at a minimum. Beyond this ring of sedges begins the upland vegetation zone where trees, shrubs, wildflowers, grasses is recommended.

Each ring serves several functions. The wetland plants that grow in the shallow water along the pool's edge are especially valuable because they:

1. Enhance pollutant removal by encouraging microorganisms that remove an excess of harmful nutrients from dissolved water.
2. Improve the basin's appearance by disguising water level changes and floating debris.
3. Provide habitat for insects such as dragonflies that eat mosquitoes.
4. Discourage resident waterfowl from leaving the water area.
5. Make the basin less attractive for swimming and wading.
6. Aid in keeping maintenance cost lower since chemical treatment of algae will be avoided.

DETENTION BASINS

Dry bottom storm water storage areas should be designed to serve a secondary purpose for recreation, open space, or other types of uses that will not be adversely affected by occasional or intermittent flooding. A method of aesthetically carrying the low flow (Low Flow Channel) through these areas shall be provided with a positive gravity outlet to a natural channel or storm sewer.

The Low Flow Channel should be designed as a serpentine channel rather than a straight swale configuration. The minimum planting width for the channel should be three feet. It is preferred that the channel varies in its width. These dry-bottom storage areas can be enhanced with the addition of trees. The suggested tree list provided consists of plants, which can tolerate intermittent flooding. These should be planted in natural groves. At least three different species of trees should be specified for use.

Outlet control systems should be designed as simply as possible and shall require little or no attention for proper operation. Each storm water storage area shall be provided with a method of emergency overflow in the event that a storm in excess of the 100-year flood frequency storm occurs. This emergency overflow facility should be designed to function as part of the "natural" or surface channel system.

SELECTED PLANT MATERIALS

The types of vegetation planted should depend upon location, climate, and soil conditions. Species that are native to the area are naturally better suited to extremes of the hardiness zone in southeastern Wisconsin and site specific microclimates. Aggressive species are very easy to establish but should not be planted. They will out compete other valuable species and will eventually dominate. Plant materials selected shall be good quality native Wisconsin species and of local 50-150 mile genotype whenever possible.

Selection of plants for the shoreline zones is closely tied to the hydrology of the site, particularly water depths and flood duration. Factors such as shading, water clarity, and salinity should be taken into account as well. Planting in open water areas typically involves the use of tubers, plugs, and potted plants. Planting in non-ponded wetland zones often involves both seeds and live plants. Project planners must be familiar with different types of plants that can be used, depending on the site's characteristics. Field tests can be useful to delineate planting zones on a site that contains a range of hydrologic regimes. It is important to use a diverse mix of wetland plants.

The following species lists are intended as a helpful guide for selecting plant and seed materials. Additional species can be considered for approval as long as they meet the requirements set forth, are hardy for the area, and are site specific. Seed mixes should be comprised of species compatible to the planting situation and soils.

A more extensive seed and plant list, as well as a list of sources, is available from the City Engineering department.

Retention - Emergent Zone:
The following list suggests plants appropriate for the Emergent Zone.
A minimum of one (1) plant per sq. ft. of AQE plants must be shown on plan.

Aquatic Emergent Plants: ***(AQE)***

Scientific Name	Common Name
Alisma Plantago-aquatica	Common Water-plantain
Eleocharis erythropoda	Red-Rooted Spike rush
Juncus effusus var. spiralis	Common Rush
Juncus torreyi	Torrey's Rush
Pontederia cordata	Pickerel Weed
Ranunculus flabellaris	Yellow Water Crowfoot
Sagittaris latifolia	Common Arrowhead
Scirpus americanus	Chairmaker's Rush
Sparganium eurycarpum	Common Bur Reed
Scirpus validus	Great Bulrush
Scirpus acutus	Hard-stemmed Bulrush

Retention- Lower Shoreline Zone:
The following list suggests plants and/or seed appropriate for the Lower portion, near the waters edge, within the first 5- ft. of the Shoreline Zone. The Shoreline Zone requires seeding as specified in 3 (A, B) of the Shoreline Zone Seeding section. Plants may be included at the rate of one (1) plant per 4-sq.ft.

Forbs:

Scientific Name	Common Name
Angelica atropurpurea	Angelica
Asclepias incarnata	Marsh Milkweed
Caltha palustris	Marsh Marigold
Chelone glabra	Turtlehead
Equisetum hyemale	Tall Scouring Rush
Eupatorium maculatum	Joe-pye Weed
Eupatorium perfoliatum	Boneset
Lobelia cardinalis	Cardinal Flower
Liatris pycnostachya	Prairie Blazingstar
Lobelia siphilitica	Great Blue Lobelia
Iris (versicolor)	Blue Flag Iris
Physotegia virginiana	Obedient Plant
Ranunculus septentrionalis	Swamp Buttercup (shade)
Solidago gigantea	Late Goldenrod

Detention- Low Flow and Retention -Upper Shoreline Zone Seed/Plants:
The following list suggests plants and/or seed mixes for the Low Flow Channel and the Upper Shoreline Zone. Further information and requirements can be found below under the Seed mix heading below and in the Shoreline Zone section 3 (A, B) under Seeding. Shoreline and Low Flow Zones require one (1) plant per 4-sq. ft. Grasses shall be seeded at a density of 8-lbs /acre. Forbs shall be seeded at 6-8 lbs. per/acre.

Forbs:

Scientific Name	Common Name
Aster novae-angliae	New England Aster
Athyrium filix-femina	Lady Fern (shade)
Chelone glabra	Turtlehead

Eupatorium maculatum	Joe-pye Weed
Eupatorium perfoliatum	Boneset
Liatris pycnostachya	Prairie Blazingstar
Lobelia siphilitica	Great Blue Lobelia
Physotegia virginiana	Obedient Plant
Zizia aurea	Golden Alexanders
Solidago gigantea	Late Goldenrod
Vernonia fasciculata	Ironweed
Veronicastrum virginicum	Culver-Root
Tradescantia obiensis	Spiderwort

Retention- Upper and Lower portions of the Shoreline Zone:
The following sedges and grasses are suggested species for the Shoreline Upper (U) and Lower (L) portions. The species listed may also be suitable for grass and sedge species which are required in Detentions Zones.

Grasses/Sedges:

Scientific Name	Common Name
Adropogon gerardii	Big Bluestem (U)
Glyceria striata	Fowl Manna Grass (U/L)
Calamagrostis canadensis	Blue Joint Grass (U/L)
Sorghastrum nutans	Indian Grass (U)
Spartina pectinata	Prairie Cord Grass (U/L)
Carex vulpinoidea	Brown Fox Sedge (U/L)
Carex stipata	Common Fox Sedge (U/L)
Carex Bebbii	Bebb's Oval Sedge (U)
Carex lanuginosa	Woolly Sedge (U/L)
Carex stricta	Common Tussuck Sedge (L)
Carex lacustris	Lake Sedge (L)

Zones with Trees:
The following trees are suggested, but not limited to, for each of the subsequent categories. For areas where occasional wet conditions may occur – Detention Bottom Zone (D-BZ). For drier, upland areas or conditions that do not have periods of standing water, use Retention/Detention Upland (R/D –U) or Detention Fringe (D-F).

Trees:

Scientific Name	Common Name
Acer rubrum	Red Maple (D-BZ)
Acer saccharum	Sugar Maple (R/D-U)
Acer sacchrinum	Silver Maple (D-BZ)
Larix laricina	Tamarack (D-BZ)
Alnus rugosa	Speckled Alder (D-BZ)
Betula nigra	River Birch (D-BZ)
Carya glabra	Shagbark Hickory (R/D-U)
Celtis occidentalis	Hackberry (R/D-U) (D-BZ)
Gymnocladus dioicus	Kentucky Coffee Tree (D-F)
Fraxinus pennsylvanica	Green Ash (D-BZ), (R/D-U), (D-F)
Pinus strobus	Eastern White Pine (D-F), (R/D-U)
Quercus bicolor	Swamp White Oak (D-BZ)
Quercus macrocarpa	Bur Oak (D-BZ), (D-F), (R/D-U)
Thuja occidentalis	White Cedar (D-BZ)
Tilia americana	Basswood (R/D-U)
Quercus rubra	Red Oak (R/D-U)

Shrubs:

The following are acceptable woody shrubs for the Retention/Detention Upland Zone- (R/D-U), Detention Fringe Zone- (D-F), and Detention Bottom Zones- (D-BZ).

Scientific Name	Common Name
Aronia melanocapa	Black Chokeberry (R/D-U), (D-F)
Comus stolonifera	Red-osier Dogwood (D-BZ), (R/D-U)
Comus amomum	Silky (blue fruited) Dogwood (R/D-U), (F)
Cornus alternifolia	Alternate-leaf Dogwood (D-BZ)
Corylus americana	American Hazelnut (R/D-U), (D-F), (D-BZ)
Sambucus canadensis	Elderberry (R/D-U), (D-F), (D- BZ)
Viburmum lentago	Nannyberry (R/D-U), (D-F), (D-BZ)
Viburmum rafinesquianum	Downy Arrow-wood (R/D-U), (D-F)
Amelanchier laevis	Serviceberry (R/D-U), (D-F), (D-BZ)
Cephalanthus occidentalis	Buttonbush (D-BZ)
Hamamelis virginiana	Witch Hazel (R/D-U)
Ilex verticillata	Winterberry (D-BZ)
Diervilla lonicera	Dwarf Honeysuckle (R/D-U), (D-F)*

*Note: Do not use the aggressive non-native honeysuckles as *Lonicera tatarica, L. japonica,L. morrowi, L. maackii, or L. x-bella, and their cultivars.*

PROHIBITED PLANT MATERIALS*

The following species are strictly prohibited. They have aggressive features which make them difficult and costly to control.
*Also see the WDNR Manual, *Invasive Plants of Wisconsin* or the WDNR web site for further updates on aggressive species that should not be used in the State of Wisconsin.

Prohibited:

Scientific Name	Common Name
Phalaris arundinacea	Reed Canary Grass
Phragmites australis	Common Reed Grass
Lythrum salicaria	Purple Loosestrife
Rhamnus cathartica	Common Buckthorn
Rhamnus frangula	Glossy Buckthorn
Elaeagnus umbellata	Autumn Olive
Lotus corniculata	Birdsfoot trefoil
Coronilla varia	Crown Vetch
Hesperis matronalis	Dames Rocket
Daucus carota	Wild Carrot
Melilotus alba	White Sweet clover
Vinca minor	Periwinkle
Celastrus orbiculatus	Oriental bittersweet
Acer plantanoides	Norway Maple
Lonicera- tatarica, japonica, maackii, morrowi, and x-bella species	All non native varieties of Honeysuckle

The following shall not be planted due to the ability to arrive over time by natural succession.

Typha latifolia	Common Cattail
Typha angustifolia	Narrow -Leaved Cattail

Retention and Detention Bottom Zones:
The Bottom Zone of Retention Basins can potentially establish vegetation through natural succession and therefore, do

not require vegetative planting. However, Detention Basins require a selected list of vegetation for the sites that are capable of tolerating both occasionally wet to dry conditions. A wide variety of species are available through the sources listed provided by the City Engineering Department.

Mowed Areas:
Sow turf at 4-1bs/1000-sq. ft. or use a standard turf seed mix and recommendation. Creeping varieties can establish themselves into native areas causing a loss of the desired native species. Therefore, creeping turf varieties should be eliminated or limited to a percent of weight by the total seed mixture. Care should be taken so that seed mixes do not contaminate native areas during seeding and that mowing of turf areas do not expand the turf area beyond the original set turf limits. Woven seed impregnated erosion control blankets are allowed on slopes used for turf areas. But not in native seeded areas.

SITE PREPARATION AND INSTALLATION GUIDELINES

Successfully constructed storm water basins and accompanying landscapes are a direct result of the quality of installation. Improper planting techniques will adversely affect the growth of new plant materials. Quality products and proper installation also reduce the amount of maintenance required. A healthy vigorous plant requires less maintenance than a sick or problematic plant. Therefore, it is essential that all new planting installations be done in a careful manner.

The most frequently overlooked aspects of emergent, wetland and upland native planting involve site preparation. Once properly installed, maintaining the seeded and planted areas until they are established, are equally critical in the creation of a successful self-functioning basin.

Once the basic excavation of the storm water basin has been completed, it is time to create the major topographic features within the basin's zone of influence, such as berms, wedges and deep-water channels. A skid loader or other excavator can be used to form the internal complexity within the basin. These features can only be added while working in - a waterless basin. Spot surveys should be made to ensure that the interim elevations are three to six inches below the final elevations. During design and preparation of the site consideration shall be given to the following:

1. Grading of the basin to interim elevations
2. Preparation of the planting/wetland bed
3. Installation of the plants and/or seed mix
4. Maintenance

SITE PREPARATION OF AREAS -EXCLUDING THE EMERGENT ZONE

Site preparation is very important for success of a native planting. Native grasses and wildflowers are long-lived but very slow to start and are subject to intense competition of weeds. It is common to have insignificant flowering within the first two years while the plants establish their deep root system. The quick start or early succession species, in addition to native grasses and cover crop will provide support for the flowering forbs until they become established.

- Determine your site location, design and soil type*
- Select the proper plant species and/or seed
- Free the site of weeds as much as possible
- Seed areas or plant and seed
- Include maintenance to ensure success

Soil Preparation and Elimination of Vegetation:
Although there may be a preference to add topsoil for seeded areas, it is possible to grow native species without the addition of topsoil. With proper selection, these species will even grow through clay. Adding topsoil has the

disadvantage of introducing new dormant undesirable seeds. If adding topsoil, add 4-6 inched of clean topsoil over the area to be seeded. Whichever method is used, the site should be free of vegetation prior to seeding. The soil should be as least disturbed as possible to prevent the growth of a dormant weed bank. Therefore, cultivating the site is not recommended. Apply a glyphosate herbicide (*Roundup*) to eliminate existing vegetation. (In the presence of water use *Rodeo* or an equivalent brand). It is best to eliminate vegetation at least twice with a several week waiting period between applications to allow re-germination of weed seeds which arrive at different seasons. Using this method the site will be ready to plant in fall or first thing in spring.

*Note: Soils with *Atrazine* must be allowed to break down for 2-3 years in order to support native planting.

Seeding:

On smaller sites (2 acres and under), seeding can be done by hand broadcasting. Use a mechanical "No-till" seeder for larger areas, over 2 acres. When mechanically seeding, follow the manufacturer's directions. If hand broadcasting, mix the seed on a large tarp with a mix of moist inert, of light weight material (cranberry compost). Use 2 bushels of compost for each 1000 square feet of area being seeded. It is suggested that you break the area into sections and allow each person to seed each section by hand broadcasting. This method works especially well for fall plantings and eliminates the need to lightly rake or roll the seed to make contact with the soil. Walking onto the seed will actually help work the seed into the soil. In addition, the difference in each person's broadcast will allow for a more even and natural distribution. After planting, the freeze and thaw of the winter season will additionally help the seed penetrate into the soil.

Setting plug, potted or bare root plants (outside of the emergent zone):

After preparing the site, and selecting the plants, designate an area that will actually receive the plants. One plant per 4 square feet with over seeding will provide quicker results. With a gas powered ice auger, drill holes at the appropriate spacing and depth for either plugs or potted plants. Then set each plant into the soil and water as needed to aid in establishing a root system. Finally, cover both the roots of the plant and the plant itself (to same depth as it was growing in container). Overseeding with cover crop must be done either before or after setting plants in order to discourage weeds. However, only a careful hand-broadcasting method should be used if overseeding is done after setting the plants to prevent plant injury.

Mulching:

Add approximately 2 inches of weed-free winter wheat straw to hold in moisture and prevent erosion on sloped areas. Watering the seeded area is not needed, especially for fall plantings.

RETENTION BASIN- EMERGENT ZONE PREPARATION

Since most storm water basins are excavated to deep sub-soils, they often lack the nutrients and organic matter needed to support vigorous growth of the wetland plants. In this case, it may be necessary to add three to six inches of topsoil to the basin's Emergent Zone between one (1) foot below the normal pool to six inches above. The Retention Basin's bottom Zone does not require topsoil. Enough sediment will accumulate in the basins during construction and will only need to be removed. The following steps are recommended for preparation of the Emergent Zone.

1. Spread the topsoil to the desired depth, if required. All features above the normal pool level should be stabilized by seeding with a cover crop that does not persist. See Seeding 3(A,B). The soil should be disturbed as little as possible to prevent the growth of a dormant weed bank
2. Provide standing time for the basin. Once the final elevations are attained, the basin should be allowed to fill to the normal pool level. Wait 6-9 months for the basins to set the plant zones, which will eventually exist.
3. Measure and stake planting depths. The storm water basin is surveyed and staked at the onset of the planting season. Depths in the basin's zone of influence should be measured to the nearest inch to confirm the original planting depths. At this time, it may be necessary to modify the planting depths to accommodate the specified plant materials.

PROPAGATING THE STORM WATER BASIN- Emergent Zone

The most common and reliable technique for establishing emergent wetland plants in a retention basin is to transplant "container grown" wetland plant stock or dormant rhizome stock obtained from aquatic plant nurseries. If the appropriate planting depths are achieved, the entire wetland should be colonized within three years. Biomass and spatial coverage of wetland plants increase sharply after the first growing season.

One of the most important things in planting aquatic plants is to avoid burying the plant too deep. On a rosette plant the crown of the roots should be just above the substrate. With aponogetons, the tuber should be placed at a 45 degree angle with the growing tip just above the gravel. On bulb plants, such as the onion plant, the bulb should be 3/4 above the substrate. With rhizome plants, the rhizome itself should be either tied to a branch or rocks with string, or at least above the substrate with only the hair roots of the plant down in the substrate.

The following guidance is suggested when transplanting is used to establish a storm water wetland:

1. The transplanting window for aquatics extends from early April to mid-July. Planting after these dates is quite chancy, as emergent wetland plants need a full growing season to build the root reserves needed to get through the winter. Plants, therefore, should be ordered at least six months in advance to ensure availability.

2. To add diversity to the wetland, 10 to 15 species of emergent plants should be planted. Of these at least three species should be aggressive colonizers.

3. No less than 70% of the Emergent Zone surface area should be planted in pods or drifts two (2) feet apart. Emergent plants planted in pods shall have 4 to 5 species per pod to allow for a more natural appearance and complementary diversity.

4. If single specie drifts are desired, the wetland area should be subdivided into separate planting zones of suitable depth for the species of plant to be introduced to that area. A different species of plant should be planted in each drift to achieve diversity. Individual plants should be planted 12 inches on center within each single species drift.

MAINTENANCE REQUIREMENTS

The initial goal of maintenance is to provide a successful native seed and planting area while keeping out the unwanted competitors. Shrubs, and trees, for example, need adequate water for healthy root systems, along with proper pruning in order to prevent disease and damage to their branch structures. Good maintenance practices provide a well-maintained landscape with minimal harmful environmental impacts including a limited need for chemical use. Other procedures applicable to landscape are developed and specific terms for each area are implemented within the storm water basin.

Failure to regularly maintain as suggested in this section shall constitute a violation of this provision which may be enforced in accordance with City of Franklin Building Inspection policy. Notice of noncompliance may be issued to the owner requiring immediate fulfillment of maintenance requirements. The City may correct, repair or replace landscape materials as required by this provision. Costs for such repair, or replacement will be covered by the owner's Maintenance Security Deposit.

Often trash removal is a requirement of the maintenance program. Trash is usually found in substantial quantities during various phases of construction. Periodic inspections, to be determined by city staff, and satisfactory maintenance of the basin will ensure their environmental integrity, aesthetic enhancement and wildlife benefit for future generations. Monitoring reports may be required by the City to track required maintenance procedures.

General Guidelines

1. The property owner shall be responsible for the regular maintenance of all required landscape areas and plant materials in a vigorous and healthy condition free from disease, pests, weeds, and litter. Such maintenance shall include weeding; hand cutting, watering, pruning, mowing, mulching, etc.

A. The property owner shall consult with knowledgeable persons in the field in order to obtain a list of directions on general maintenance procedures and timing for the particular zone. The property owner should then submit a landscaping maintenance plan for review. Cutting or mowing of native areas shall be done on an as needed basis to control unwanted woody growth. Additional methods of cutting from persons knowledgeable of native landscape maintenance are also acceptable.

B. Properly supervised personnel, trained in accordance with accepted native landscape practices shall perform all work. Licensed personnel will apply chemicals when proven necessary to control problems that cannot be otherwise resolved by other methods on an as needed basis.

C. Dead, diseased, or severely damaged plant materials, that have been required, shall be removed by the owner as soon as possible, but no later than 60 days after notification. All such plants shall be replaced within six months of notification or by the next planting season, whichever comes first.

D. Replacement plants must be of the same size and species as shown on the approved landscape plan or must be equivalent in quality and size. Such replacements will not be considered an amendment to the approved plan.

E. All water necessary during the initial installation period of the first year shall be provided by the owner with adequate hose bibs and/or hydrants. Owner shall water with a tanker truck if needed. The owner shall provide removal of aggressive non-native species, until plantings have established for a minimum of two growing seasons. Watering of native seeded areas is not required unless the planting would benefit from water during an extremely dry year.

Weed Control:
Weed control starts with clean, properly prepared planting areas that are maintained through an integrated management program. The main type of maintenance presently utilized for the care of aquascapes, and transitional zones is manual removal and hand-pulling of invasive weeds and exotic vegetation.

Hand cutting is preferred for the first 2-3 years, to keep undesirable plants/grasses from encroaching into the planting bed and to maintain healthful structure of the planting. Hand cutting prevents disturbance of seedling root systems while discouraging large competitive weeds. Mowing methods may also be used to control weeds but must be completed in accordance with native area control methods. Only after 2-3 years hand weeding may be done.

General use of Pesticides:
Pesticides are harmful to the environment and should not be used unless other methods have been unsuccessfully implemented and more vigorous treatment is needed to avoid a loss of plant species. If pesticides need to be used, they shall be applied in accordance with manufacture directions. Applications of pesticides in the environment should be pest specific, time specific, quantity controlled and monitored for effectiveness. Pesticide use should not become routine or institutionalized on a "blind" schedule. As chemical technology changes, it is important to stay current on all Integrated Pest Management techniques.

Before using a pesticide, however, it is important that the property owner considers more environmentally advantageous alternatives. Mechanical and biological controls are two methods that are preferred over pesticide applications. Nontoxic chemicals and biodegradable chemicals are also available for effective pesticide use.

Environmental quality and its protection are a high priority. The landscape investment needs to be protected from pest damage. This fact needs to be balanced with the goal of protecting the neighboring waters, soils, flora and fauna from damaging chemical build-up. Environmental conditions such as temperature, humidity, rainfall and snow cover influence pest populations and can help to predict periods when pests are likely to reach unacceptable levels.

Mowing:
The native seed mix areas or non-maintained turf areas must be mowed or burned every three years to prevent woody growth. More frequent mowing is not recommended due to negative effects noted on seed reproduction. Hand removal of woody growth can also be done in place of mowing. More frequent mowing may be necessary if the basin is to be used for recreational uses. Frequently inundated areas should be mowed no more than twice a year. Mow bottom zones during their dry periods.

Fertilizing:
Fertilizing is prohibited in the Shoreline, Emergent and Bottom Zones of Retention and Detention basins. Fertilizer is a major contributor of excessive algae growth and should only be used as needed in allowable areas. Fertilizing is not needed for growth of native prairie species due to the deep root structure and high tolerance to changing condition. Furthermore, fertilizer gives unwanted non-native weeds an advantage over indigenous species.

Insect, Disease and Rodent Control:
Monitor plants for the presence of insects, disease or rodent damage. After the cause of the pest problem is identified, the appropriate method of control can be determined. . The foliage of affected plants should be removed and disposed of off-site.

RETENTION BASIN EMERGENT ZONE (WETLAND) MAINTENANCE & MONITORING

Proper site preparation and immediate preventative care in the early stages after planting will save future maintenance and clean-up costs. Although a well-planted "aquascape" will help to ensure initial success, regular maintenance is necessary for the ongoing survival of the plants. Weather, water level fluctuations, turbidity and other variables can impair the survival rate of planted materials. Prior to approval, planting regulation should be made to require a guarantee of plant coverage and adequate survival for 2 years. Sound principles of weed control should prevail throughout a wetland management program. Preventative weed control is the most effective means of saving money and perpetuates the value of a planted site.

With regular maintenance, storm water basins can be a very reliable and attractive way to control storm water pollution. Routine basin landscape maintenance and factors that should be considered for wetland plantings are described below:

Pond maintenance:

- Tree leaves and debris should be skimmed and discarded in fall and spring to avoid large deposits at the bottom of the pond.
- Once a year, the inlet and outlet should be inspected and any necessary repairs made.
- The pond will require dredging, typically once every 15 to 25 years.
- Desired vegetation should be maintained consistently and unwanted vegetation must be removed regularly to establish diversity.

Initial and long-term management and maintenance.

Noxious weeds can be controlled in a variety of ways. Controlled burning is a common technique and a 3 year rotation for prescribed burnings is appropriate. Fires in wetland areas where cattails and giant reed grasses are present can be very intense, therefore not recommended. For these areas, other alternatives of maintenance are encouraged. Invasive species can also be removed from wetland areas by physically extracting them from the site. For species that are particularly difficult to eliminate using prescribed burning or physical extraction approaches, chemical control of non-native species is sometimes warranted. Herbicide techniques are different from those used in upland sites, primarily because herbicides have to be licensed for use in or near water bodies, wetlands, and other aquatic systems. Chemical means of weed luction should be used only when necessary, and product labels should be read and closely followed by a licensed rbicide applicator .

If hydrologic and soil conditions are conducive to plant growth, wetland plantings often respond very quickly. An extensive native plant cover often can be achieved during the first growing season. Noxious weed control using mowing

or pruning is often necessary during the first several years. Some replanting might also be necessary. A stable, diverse, and aesthetic basin might take 3 to 5 years to achieve.

It is important to understand that the success of wetland plants will not be immediate and that the effort does not end with the planting itself. Wetland plants should be routinely monitored. If the plantings do not appear to establish themselves, it is important to reevaluate the site selection and conditions before replanting. Please be patient. With each re-vegetation effort, new information about suitable habitat and conditions will be gained from both successful and unsuccessful planting attempts.

TREE CARE

1. Watering: All trees shall be watered as necessary to maintain vigor. On average, trees require one inch of rainfall a week. Supplemental watering is necessary if this rainfall does not occur. Water availability is particularly critical during the tree's transition periods: when the tree is putting on new leaves and again at leaf drop. Plants should not be watered until a moisture check has been made of representative plants in the landscape. Check the soil to a depth of four (4) inches. If it is still moist, don't water. Over watering will suffocate the roots and kill the tree. This is particularly true in heavy, clay soils. Maintain a large enough dike around the perimeter of the root zone to fill with water. When hand watering; use a water wand to break the water force. In rainy seasons, open basins to allow surface drainage away from the root crown where excess water may accumulate.

2. Mulching: All trees in areas of maintained turf shall have a large mulch ring (4-5' diameter) around the base of the trunk at a depth of 3-4" for a minimum of three (3) years following planting. This will reduce damage to tree trunks and roots by machinery, keep roots cool, and avoid lawn/root competition. Use hand weeding whenever possible to control growth in these areas. Do not use weed whips around trees to do trimming or weeding. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of any pre-emergent herbicides if present. Do not allow the mulch to build up against the trunk of the tree.

3. Fertilizing for trees: For the first year trees that are in the Upland Zones can be fertilized once. In early spring before bud break/leaf expansion, fertilize at the root ball and at the base of the main stem; rather than spreading fertilizer evenly under the plant to drip line. Fertilize trees as needed after the first growing season.

4. Pruning: All trees shall be pruned once each year following leaf drop in late fall for the first five years following installation. Once "scaffolding" or structural branches have been established, the trees should be put on a 5-7 year pruning cycle. All pruning shall be done by persons trained in proper pruning techniques.

5. Insect Control: Carefully monitor trees and shrubs for increasing insect populations, particularly in early spring. Especially active at this time are the chewing and sucking insects such as aphids, inchworms, leafhoppers, sawflies, and tent caterpillars. Upon identifying their source, try treating with a mild insecticide soap. Only if the soap fails to control the problem, apply a broad spectrum contact insecticide between May 15 to June 15 to affected trees.

6. Disease Control: Carefully monitor trees for any disease. Treatments are based on extent of the damage and the environmental impact of the product chosen. If it is suspected that a tree is diseased, consult with the County Extension Agent.

7. Special Needs: Some trees have a tendency to become chlorotic due to a mineral or nutrient deficiency. The symptoms of chlorisis are manifested in a yellow or pale green leaf color with darker green veins. Trees up to 3" can be treated for Iron Chlorosis by broadcasting one (I) pound of granular sulfur from inside the drip line to the trunk in a 10' xI0' area. Larger trees (4-8" cal.) will require four (4) pounds broadcast around the tree in a 20' x20' area. Treatment should be given in early spring before the bud break/leaf expansion.

SHRUB CARE

1. Watering: All shrubs shall be watered as necessary to maintain the health and vigor of the plant. Do not

over water. Plants should be not be watered until a moisture check has been made of representative plants in the landscape. Use a probe or other tool to check the moisture in the root zone.

2. Mulching: To reduce evaporation and weed growth, bark mulch should be be maintained at a depth of 2-3" around all shrubs within vegetated turf areas. All mulched beds located in turf areas can be weeded by hand, through spot treatments, or by applying a pre-emergent herbicide to the shrub bed areas. Keep mulch away from the stems of the plants

3. Fertilization: Fertilization should be done as often as needed, but the following schedule is recommended. Apply an organic fertilizer once in the spring. Re-fertilize in early to mid-summer. In the fall, it may be necessary to fertilize to promote root growth .

4. Pruning: Shrub pruning is necessary to maintain the natural form of the plant as it occurs in nature. Pruning also allows plants to grow together to maximize the plant's natural beauty and to develop a dense screen. Evergreen shrubs should be pruned once a season in early summer before the end of August. All shrubs should be pruned by persons who have been trained in proper pruning techniques.

5. Insect Control: Carefully monitor shrubs in spring for insect infestation. Chewing and sucking insects such as aphids, inchworms, leafhoppers, sawflies, and tent caterpillars tend to pose the biggest threat. First try spot controlling overpopulated areas with a mild insecticide soap. Only if the problem persists, apply a broad spectrum contact insecticide If help is needed with the identification of an insect problem or treatment, consult with your County Extension agent.

Disease Control: Carefully monitor shrubs for disease. Since treatment can impact the environment, consult with a County Extension Agent in the event that a tree is suspected to be diseased.

DEFINITIONS

Assimilation Capacity The amount of nutrients that wetland plants can absorb before reaching an over abundant amount that cannot be absorbed.

Aquatic Emergent Plant (see emergent plant)

Berm An earthen mound designed to provide visual interest, screen undesirable views and/or decrease noise.

Buffer The use of landscaping generally consisting of natural vegetation other than mowed turf; plant material, berms, walls, or decorative architectural features that at least partially and periodically obstruct the view from an incompatible development, street, or natural resource feature. Buffers are typically defined and graphically indicated on a site plan.

Buffer Zone An area of vegetation maintained around the shoreline of a body of water or edge of a dry basin that reduces impacts to water, runoff pollutants, and vegetation and wildlife from adjacent upland activities. This differs from a Buffer designed for visual screening of non-compatible developments or features.

Detention Basin A man-made or natural depression below the surrounding grade level facility that is designed to collect water during large storms so that it impedes the water and releases it at a rate not greater than that before development; basins with an outlet. These facilities are normally dry with periods of water during rain fall.

Deciduous A plant with foliage that is shed annually.

Development The carrying out of any building activity, that causes changes to the use or

	appearance to any structure or land including but not limited to: erection or removal of buildings or other structures, dredging, grading, paving, excavation stripping, clearing or removal operation, and altering of the land.
Drift	A planting or design technique where wetland plants are grouped in large masses. Drifts are typically planted with a single species. However, plant diversity in the retention basin is obtained by multiple drifts of varying plant species
Emergent Plant	An aquatic plant that is rooted in the sediment but whose leaves are at or above the water surface. Such wetland plants provide habitat for the wildlife and waterfowl in addition to removing urban pollutants
Emergent Zone	A minimum 10 foot wide ledge about 6" to 12" under water along the perimeter of a retention basin. Also referred to as the Safety Shelf.
Erosion	The detachment or movement of soil, sediment, or rock fragments by the water and/or wind.
Evergreen	A broadleaf or needle-type foliage plant that persists and remains green year-round.
Flood	A temporary rise in stream flow that results in water overtopping and an inundation of normally dry land areas.
Flood Plain	Any land area susceptible to inundation by water within the 100 year recurrence flood interval or any other area surrounding a basin susceptible to inundation.
Forb	A non-woody plant that is not a grass. This includes annual, biennial, and perennial flowers.
Forebay	A forebay at the inlet of a pond increases its effectiveness and longevity. A forebay is a three to four-foot deep basin separated from the rest of the pond by a berm, gabions or riprap. This small basin is large enough to hold at least 15% of the pond's volume. It functions as an extra storage area to trap incoming sediments before they accumulate within the basin. A forebay generally is not required for 'pocket' basins due to their small size. Care must be taken in designing a forebay so that drowning hazards are minimized through the use of safety shelves and landscaping.
Invasive Species	Plants which grow aggressively or spread and crowd out less aggressive plant species by competition. They can invade or degrade even high quality natural communites. For an up to date list of Invasive species visit the Wisconsin Department of Natural Resources web page at: www.dnr.state.wi.us/org/land/er/invasive/index.htm
Maintained Turf	Areas of mowed turf type grasses primarily consisting of lawn grass species such as Kentucky blue grass.
Native- plants /seeds	Plants or seeds which are considered to be indigenous and common to the area prior to European settlement. Native species evolved in this region they have naturally adapted to the climate, and are best suited to survive in their designated area.
Pods	A group of emergent plants of varying species selected to be complimentary to one another and spaced a minimum of two feet apart.
Rip Rap	A combination of large stone cobbles and boulders used to line channels, stabilize banks, reduce runoff velocities, and/or filter out sediment. Riprap stone sizes should be limited to 3-6" in diameter.
Retention Basin	A body of water with a depth not less than 3 ft. designed to hold a permanent pool of water.

	Levels in a retention basin will increase as a result of surface and subsurface watercollected and released gradually at an elevated outlet.
Safety Shelf	A ledge at least 10 feet wide that sits 6" to 12" under water along the perimeter of a retention basin. Also referred to as the Emergent Zone.
Sedimentation Basin	A small basin within a retention storm water basin that aids in the filtration of sediment prior to entering the main basin. Also see Forebay.
Seedbank	Refers to the large number of dormant seeds from plant species that exist within the soil. The seeds can exist within the soil for years before they germinate under the proper moisture, temperature or light conditions.
Shrub	A woody plant consisting of several small stems from or small branches near the ground . Shrubs may be deciduous or evergreen.
Storm Water Runoff	Water that results from precipitation that is not absorbed by the soil or plant material, flowing over land to basins, surface streams, rivers or lakes.
Storm Water Storage Area	Areas designated to store excess storm water .
Subsoil	The bed or stratum of earth lying below the surface soil, usually within the B or C soil horizons.
Tree	Any self-supporting woody plant that contains a root system with at least one well-defined stem or trunk supporting a definite formed crown. A deciduous tree is planted primarily for its high crown of foliage or overhead canopy.
Zone of Influence	The total area of a Storm water basin as measured from its center to the outside edge of the Upland Buffer Zone.

Disclaimer: The Guidelines set herein, shall not create a liability on the part of, or cause action against the City Franklin, or any office or employee for any damage that may result to these suggested guidelines. Any conflict or inconsistency of definitions, terms, procedures, or other discrepancy shall be governed by the Unified Development Ordinance of the City of Franklin.

* Innoculant: All legumes will receive the required innoculant necessary to become viable seed for a planting.

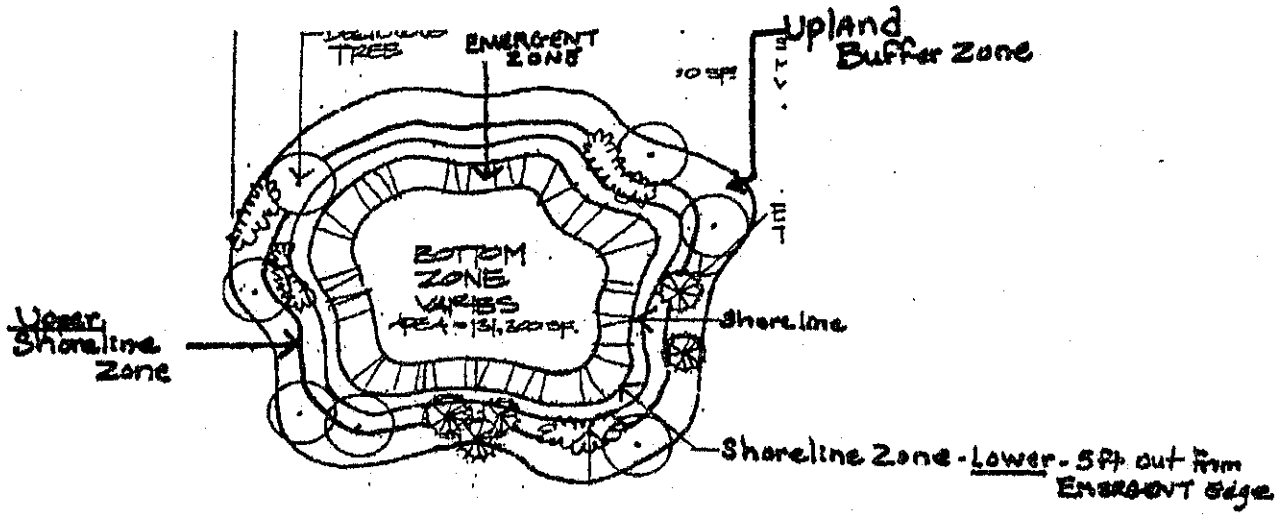

TREES
EMERGENT ZONE
30 ft
Upland Buffer Zone
BOTTOM ZONE VARIES
Upper Shoreline Zone
Shoreline
Shoreline Zone - Lower - 5ft out from EMERGENT edge

Figure A.3 Section of Typical Stormwater Management Detention Pond

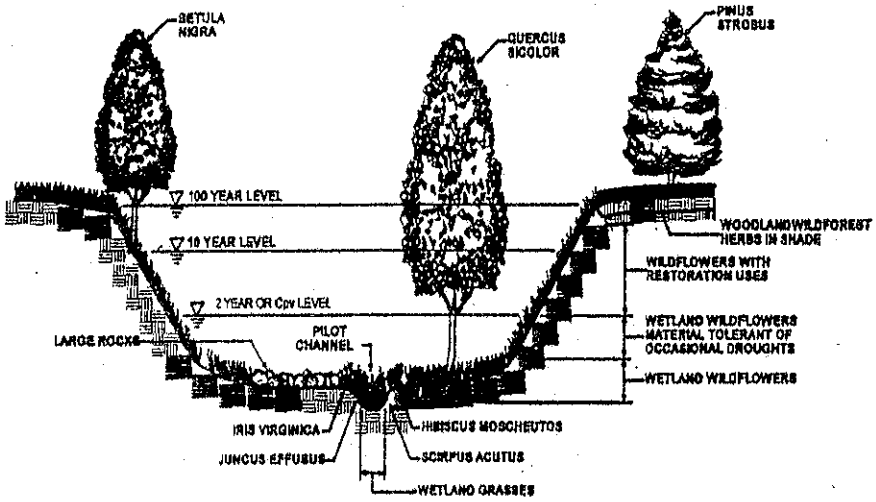
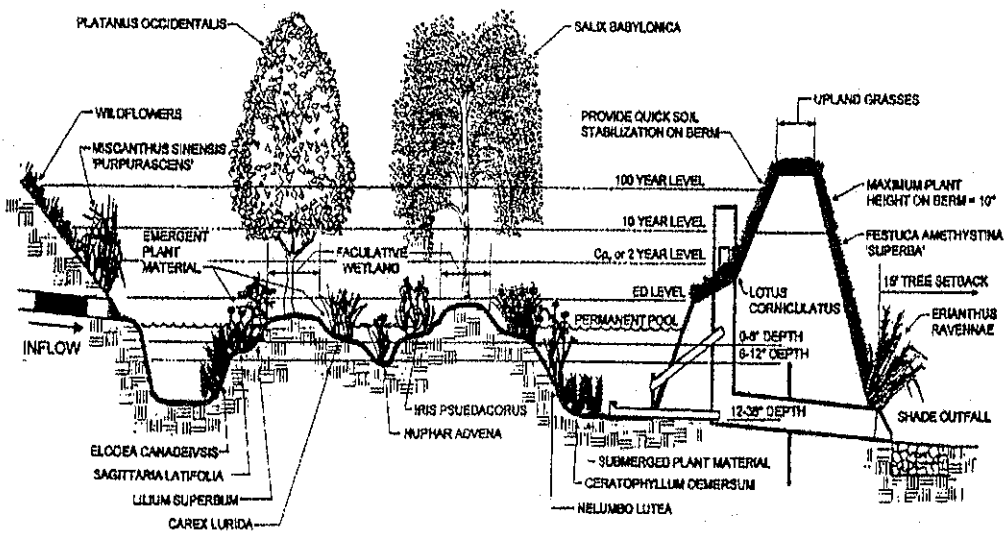


Figure A.4 Section of Typical Shallow Extended Detention Wetland System



Appendix A: Sample Design of a Storm Water Basin