Section 3.5 Storm Water Wetlands

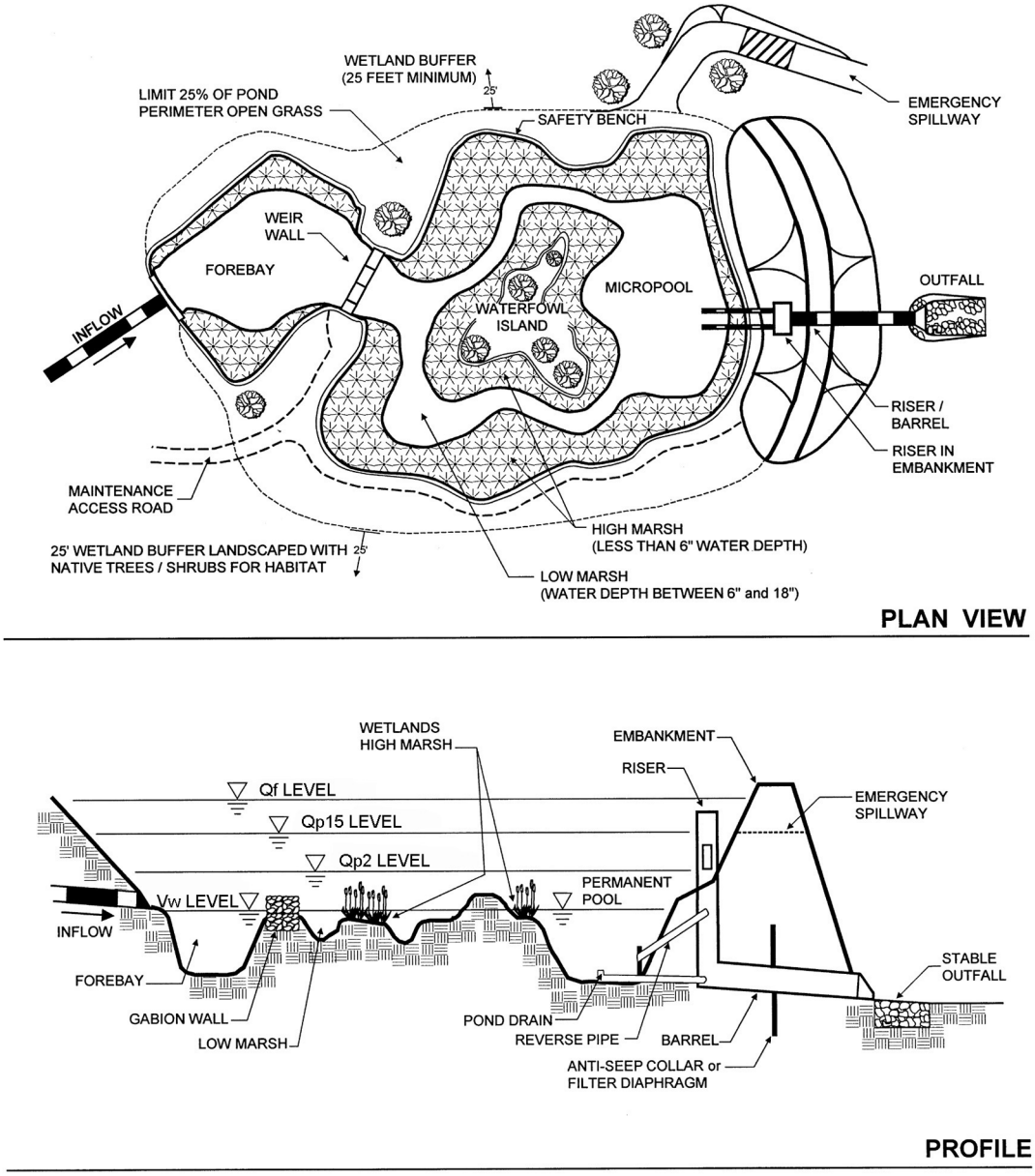
Definition: Practices that create shallow marsh areas to treat urban storm water which often incorporate small permanent pools and/or extended detention storage to achieve the full V_w. Design variants include:

- W-1 shallow wetland
- W-2 extended detention shallow wetland
- W-3 pocket wetland

Storm water wetlands may also provide storm water detention storage (Qp_2, Qp_{15}, and / or Q_f) above the V_w storage.

IMPORTANT NOTE: ALL OF THE POND PERFORMANCE CRITERIA PRESENTED IN SECTION 3.4 ALSO APPLY TO THE DESIGN OF STORM WATER WETLANDS. ADDITIONAL CRITERIA THAT GOVERN THE GEOMETRY AND ESTABLISHMENT OF CREATED WETLANDS ARE PRESENTED IN THIS SECTION.

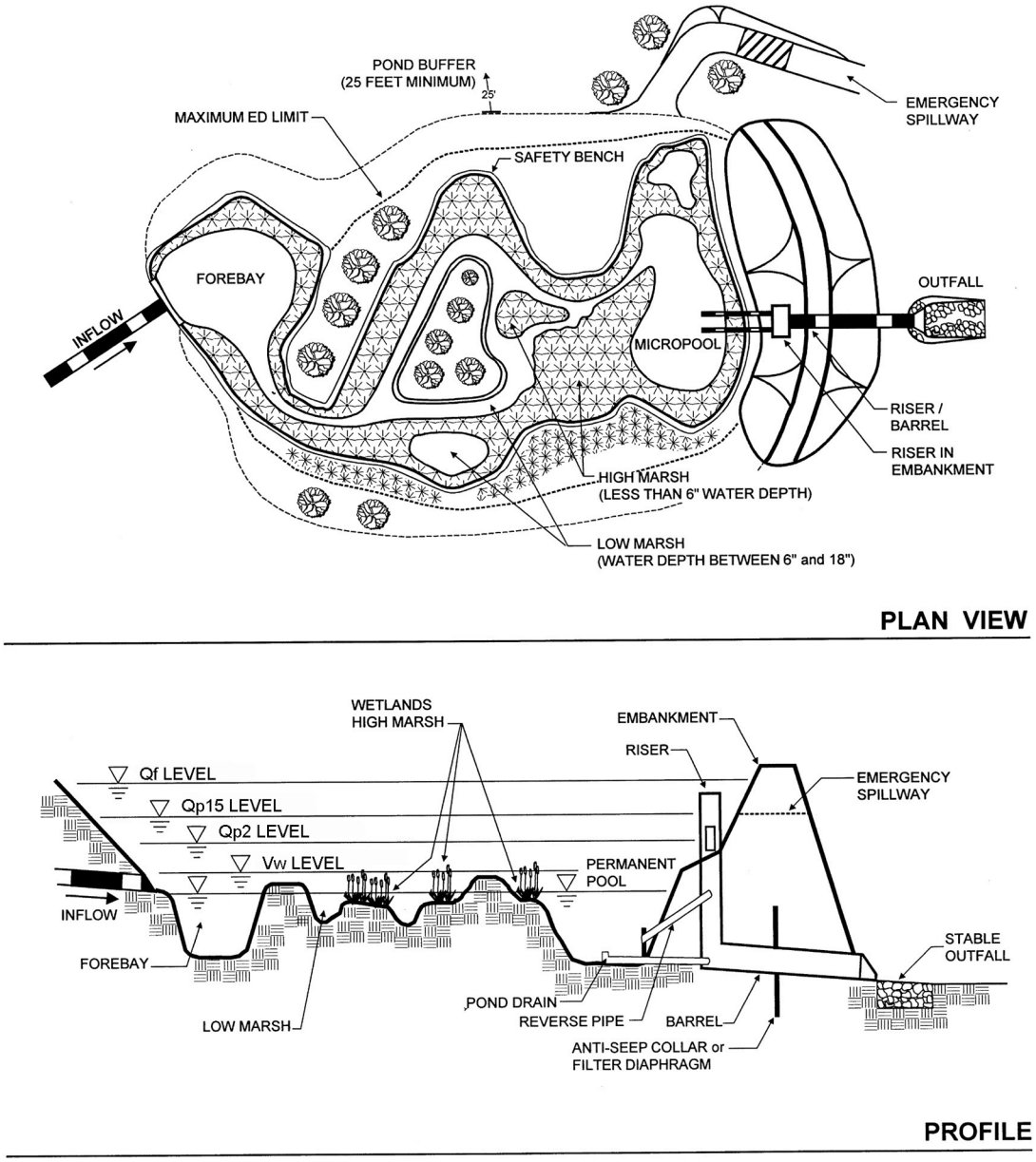
W-1	**Figure 3.23** Example of Shallow Wetland	W-1



Source: Adapted from MDE, 2000

Shallow wetlands provide V_w in a very shallow pool that has a large surface area.

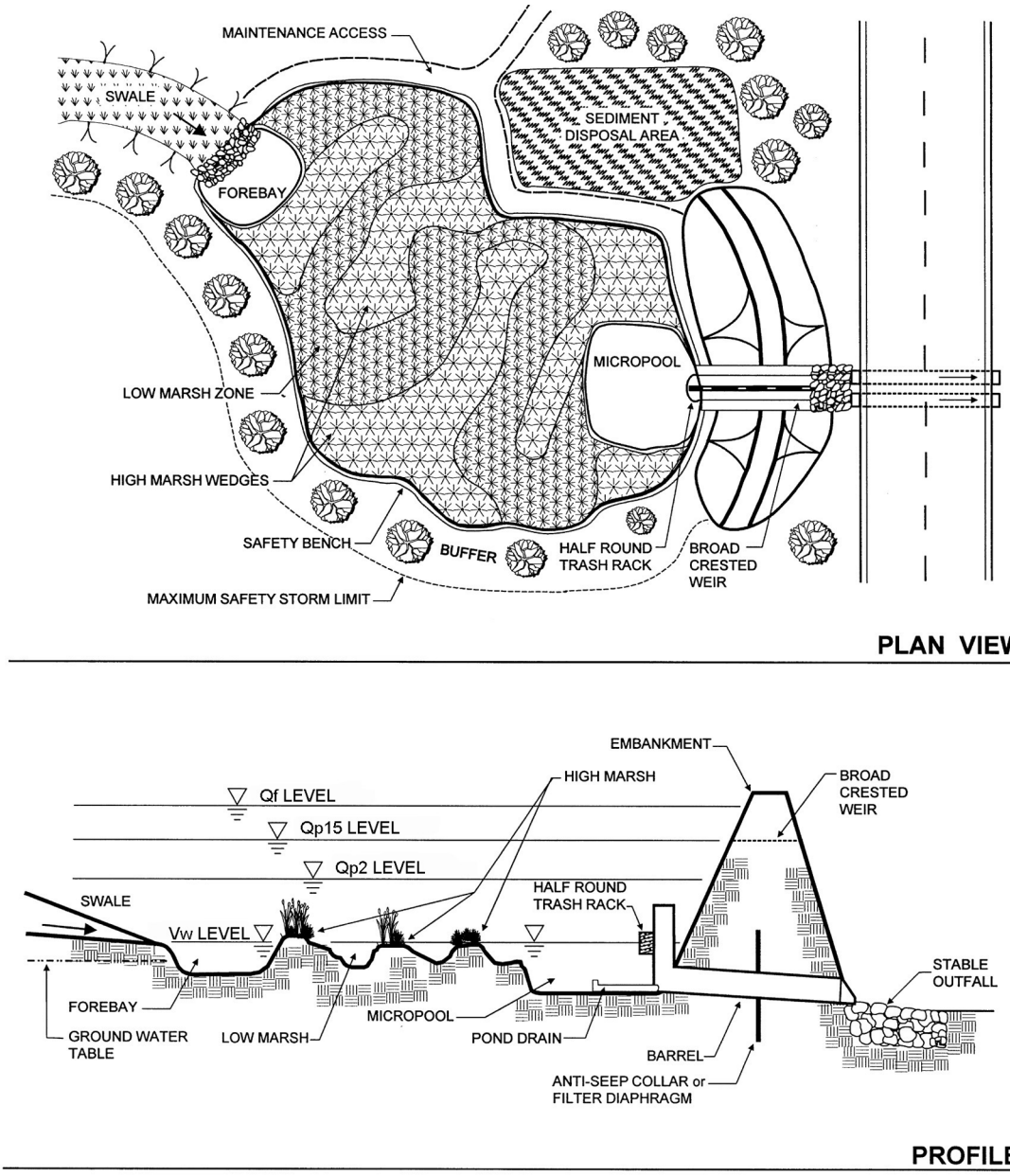
W-2	**Figure 3.24** Example of Extended Detention Shallow Wetland	W-2



Source: Adapted from MDE, 2000

ED shallow wetlands provide water quality storage by a combination of shallow marsh pool and extended detention storage.

W-3	**Figure 3.25** Example of Pocket Wetland	W-3



Source: Adapted from MDE, 2000

A high water table or groundwater interception helps maintain the shallow marsh pool in a pocket wetland.

3.5.1 Wetland Feasibility Criteria

A water balance should be performed to demonstrate that a storm water wetland can withstand a thirty day drought at summer evaporation rates without completely drawing down.

3.5.2 Wetland Conveyance Criteria

A minimum flow path of 2:1 shall be provided across the storm water wetland. This path may be achieved by constructing internal berms (e.g., high marsh wedges or rock filter cells). Microtopography is encouraged to enhance wetland diversity.

3.5.3 Wetland Pretreatment Criteria

Sediment regulation is critical to sustain storm water wetlands. *Consequently, a forebay shall be located at the inlet, and a micropool shall be located at the outlet.* Forebays are designed in the same manner as ponds (see Section 3.4.3). A micropool is a three to six foot deep pool used to protect the low flow pipe from clogging and to prevent sediment resuspension.

3.5.4 Wetland Treatment Criteria

The surface area of the entire storm water wetland shall be at least 1% of the contributing drainage area (1.5% for the shallow marsh design).

At least 25% of the total V_w should be in deepwater zones with a depth greater than four feet (the forebay and micropool are used to meet this criteria. In addition, the deepwater zones serve to keep mosquito populations in check by providing habitat for fish and other pond life that prey on mosquito larvae.

A minimum of 35% of the total surface area shall have a depth of 6" or less, and at least 65% of the total surface area shall be shallower than 18".

The bed of the wetland should be graded to create maximum internal geometry and microtopography.

If extended detention (ED) is utilized in a storm water wetland, the V_w-ED volume shall not comprise more than 50% of the total V_w, and its maximum water surface elevation shall not extend more than three feet above the normal pool. Quantity control storage can be provided above the maximum V_w elevation within the wetland.

To promote greater nitrogen removal, rock beds may be used as a medium for the growth of wetland plants. The rock should be 1" to 3" in diameter, placed up to the normal pool elevation.

3.5.5 Wetland Landscaping Criteria

A landscaping plan should be provided that indicates the methods used to establish and maintain wetland coverage. Minimum elements of a plan include: delineation of landscaping zones, selection of corresponding plant species, planting plan, sequence for preparing wetland bed (including soil amendments, if needed), and sources of plant material.

Structures such as fascines, coconut rolls, straw bales, or filter fence can be used to create shallow marsh cells in high velocity areas of the storm water wetland.

The landscaping plan should provide elements that promote greater wildlife and waterfowl use within the wetland and buffers.

A wetland buffer may extend 25 feet outward from the maximum water surface elevation, with an additional 15 foot setback to structures.

Wetland Establishment Guidance

The most common and reliable technique for establishing an emergent wetland community in a storm water wetland is to transplant nursery stock obtained from local aquatic plant nurseries. The following guidance is suggested when transplants are used to establish a wetland.

The transplanting window extends from early April to mid-June. Planting after these dates is quite risky, as the wetland plants need a full growing season to build the root reserves needed to get through the winter. If at all possible, the plants should be ordered at least three months in advance to ensure the availability of the desirable species.

The optimal depth requirements for several common species of emergent wetland plants are often 6" of water or less.

To add diversity to the wetland, 5 to 7 species of emergent wetland plants should be planted. Of these, at least three species should be selected from the "aggressive colonizer" group (e.g., bulrush, pickerelweed, arrow arum, three square and rice cutgrass).

No more than half the wetland surface area needs to be planted. If the appropriate planting depths are achieved, the entire wetland should be colonized within three years.

The wetland area should be sub-divided into separate planting zones of more or less constant depth.

One plant species should be planted within each flagged planting zone, based on their approximate depth requirements.

Individual plants should generally be planted 18" on center in clumps (Some species may be planted closer, while others can be planted at greater distances, a wetland specialist or qualified landscaping consultant may specify different planting strategies).

Post-nursery care of wetland plants is very important in the interval between delivery of the plants and their subsequent planting, as they are prone to desiccation. Stock should be frequently watered and shaded while on-site.

A wet hydroseed mix should be used to establish permanent vegetative cover in the buffer above of the permanent pool. For rapid germination, scarify the soil to 0.5" prior to hydroseeding. Alternatively, red fescue or annual rye can be used as a temporary cover for the wet species.

Because most storm water wetlands are excavated to deep sub-soils, they often lack the nutrients and organic matter needed to support vigorous growth of wetland plants. At these sites, 3" to 6" of topsoil or wetland mulch should be added to all depth zones in the wetland from one foot below the normal pool to 6" above. Wetland mulch is preferable to topsoil if it is available.

The storm water wetland should be staked at the onset of the planting season. Depths in the wetland should be measured to the nearest inch to confirm the original planting zones. At this time, it may be necessary to modify the landscape plan to reflect altered depths or the availability of wetland plant stock. Surveyed planting zones should be marked on an “as-built” or design plan, and located in the field using stakes or flags. The wetland drain should be fully opened at least three days prior to the planting date (which should coincide with the delivery date for the wetland plant stock).

Wetland mulch is another technique to establish a wetland plant community which utilizes the seedbank of wetland soils to provide the propagules for marsh development. The majority of the seedbank is contained within the upper 6" of the donor wetland soils. The mulch is best collected at the end of the growing season. Best results are obtained when the mulch is spread 3" to 6" deep over the high marsh and semi-wet zones of the wetland (-6" to +6" relative to the normal pool). Donor soils for wetland mulch shall not be removed from natural wetlands.

3.5.6 Wetland Maintenance Criteria

If a minimum coverage of 50% is not achieved in the planted wetland zones after the second growing season, a reinforcement planting will be required.