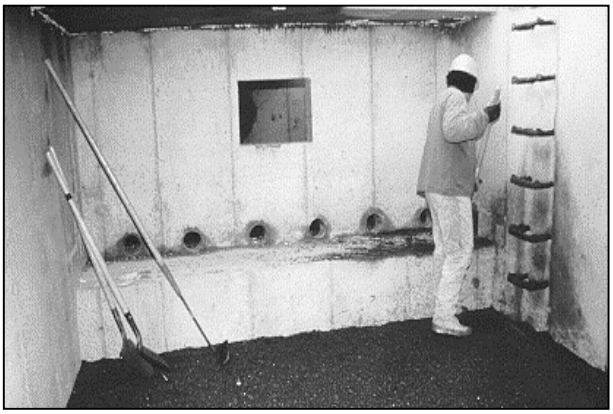
3.3.4 Underground Sand Filter

Limited Application
Structural Stormwater Control



Description: Design variant of the sand filter located in an underground vault.

REASONS FOR LIMITED USE

- Intended for space-limited applications
- High maintenance requirements

KEY CONSIDERATIONS

- High pollutant removal capability
- Filter may require more frequent maintenance than most of the other stormwater controls
- High removal rates for sediment, BOD, and fecal coliform bacteria
- Precast concrete shells available, which decrease construction costs

STORMWATER MANAGEMENT SUITABILITY

- ☑ **Water Quality**
- ☐ **Channel/Flood Protection**

SPECIAL APPLICATIONS

- ☐ **Pretreatment**
- ☑ **High Density/Ultra-Urban**
- ☑ **Other:** Hotspot areas

Residential Subdivision Use: *No*

3.3.4.1 General Description

The underground sand filter is a design variant of the sand filter located in an underground vault designed for high-density land use or ultra-urban applications where there is not enough space for a surface sand filter or other structural stormwater controls.

The underground sand filter is a three-chamber system. The initial chamber is a sedimentation (pretreatment) chamber that temporarily stores runoff and utilizes a wet pool to capture sediment. The sedimentation chamber is connected to the sand filter chamber by a submerged wall that protects the filter bed from oil and trash. The filter bed is 18 to 24 inches deep and may have a protective screen of gravel or permeable geotextile to limit clogging. The sand filter chamber also includes an underdrain system with inspection and clean out wells. Perforated drain pipes under the sand filter bed extend into a third chamber that collects filtered runoff. Flows beyond the filter capacity are diverted through an overflow weir.

Due to its location below the surface, underground sand filters have a high maintenance burden and should only be used where adequate inspection and maintenance can be ensured.

3.3.4.2 Pollutant Removal Capabilities

Underground sand filter pollutant removal rates are similar to those for surface and perimeter sand filters (see subsection 3.2.4, *Sand Filters*).

3.3.4.3 Design Criteria and Specifications

- Underground sand filters are typically used on highly impervious sites of 1 acre or less. The maximum drainage area that should be treated by an underground sand filter is 5 acres.
- Underground sand filters are typically constructed on-line, but can be constructed off-line. For off-line construction, the overflow between the second and third chambers is not included.
- The underground vault should be tested for water tightness prior to placement of filter layers.
- Adequate maintenance access must be provided to the sedimentation and filter bed chambers.
- Compute the minimum wet pool volume required in the sedimentation chamber as:

$$V_w = A_s * 3 \text{ feet minimum}$$

- Consult the design criteria for the perimeter sand filter (see Section 3.2.4) for the rest of the underground filter sizing and design steps.

3.3.4.4 Inspection and Maintenance Requirements

Table 3.3.4-1 Typical Maintenance Activities for Underground Sand Filters
(Source: CWP, 1996)

Activity	Schedule
• Monitor water level in sand filter chamber.	Quarterly and following large storm events
• Sedimentation chamber should be cleaned out when the sediment depth reaches 12 inches.	As needed
• Remove accumulated oil and floatables in sedimentation chamber.	As needed, (typically every 6 months)

Additional inspection and maintenance requirements for organic filters are similar to those for surface sand filter facilities (see subsection 3.2.4)

3.3.4.5 Example Schematic

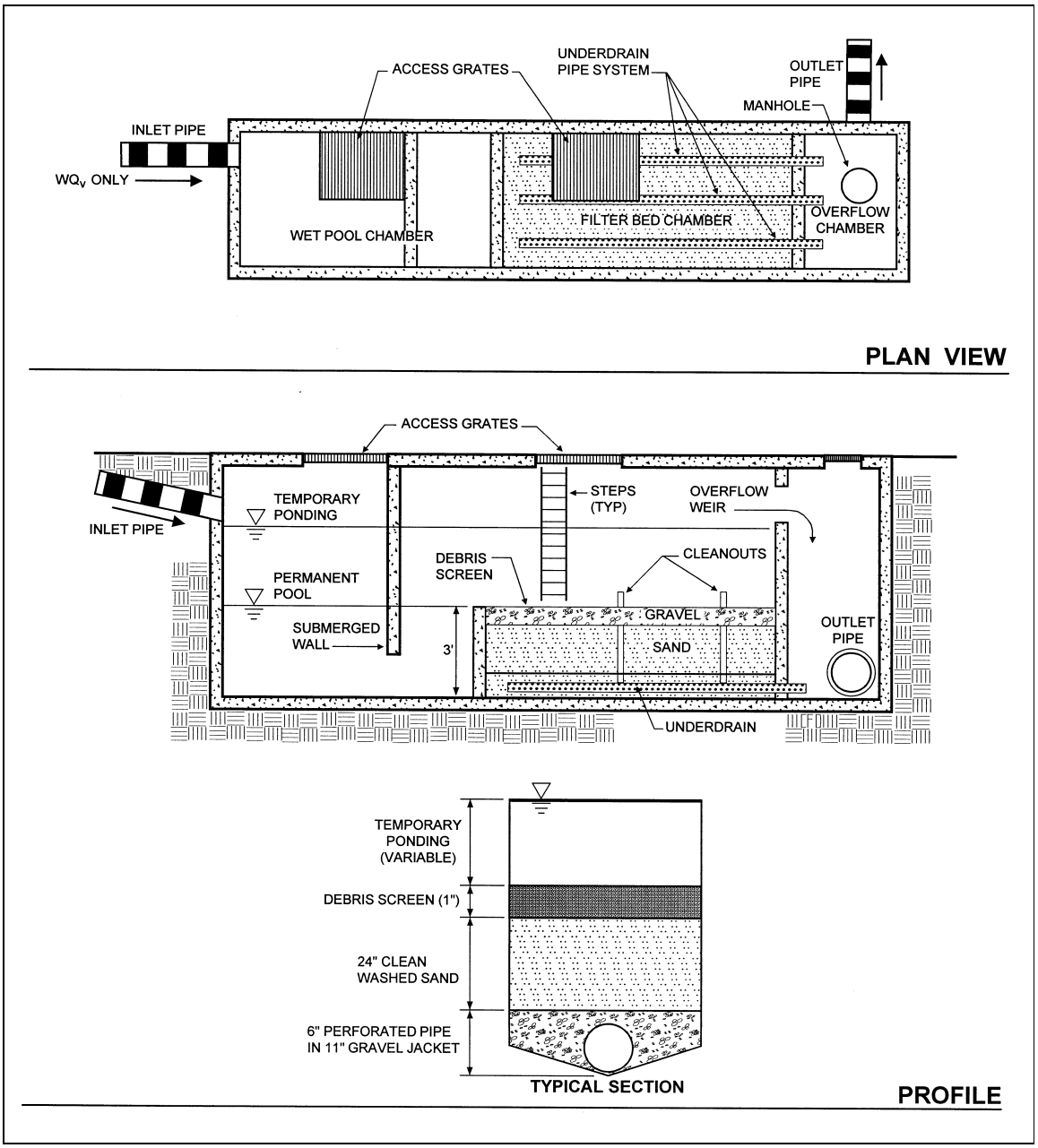


Figure 3.3.4-1 Schematic of Underground Sand Filter

(Source: Center for Watershed Protection)

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