



Reed Bed Sludge Treatment

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ENGINEERS ARCHITECTS



WWOA Spring Biosolids Symposium

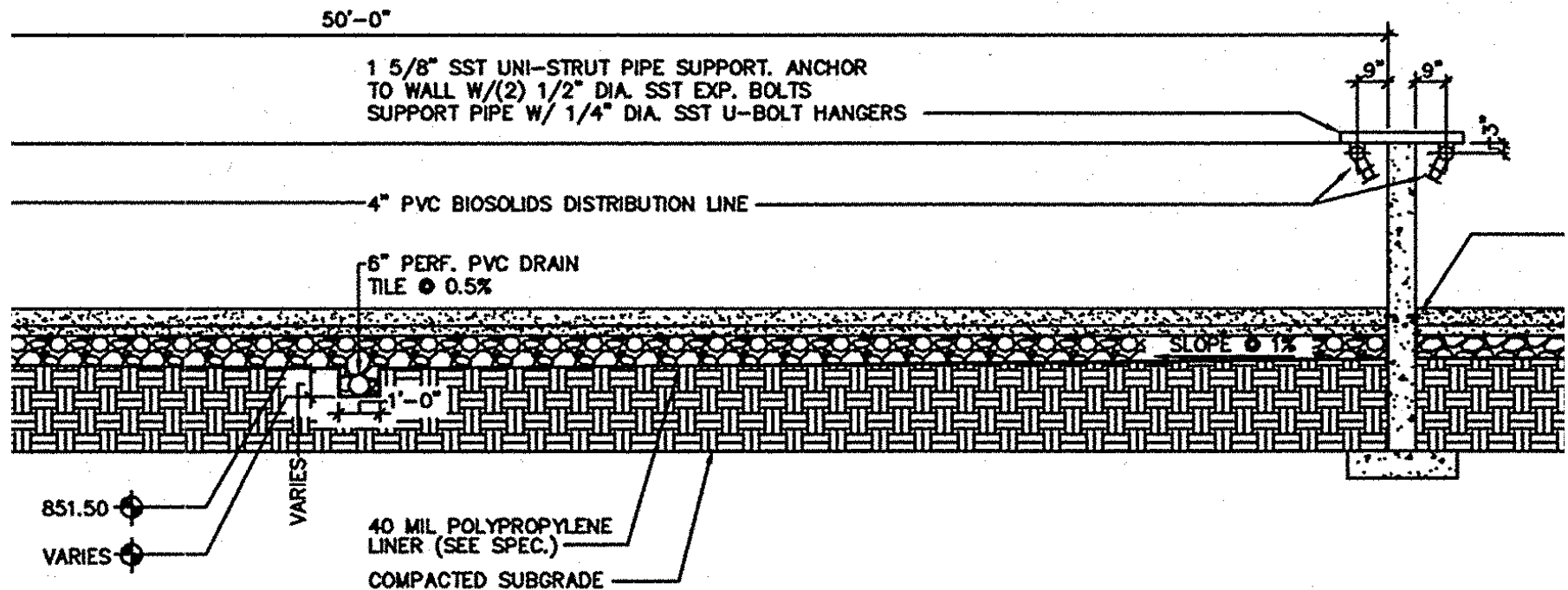
Reed Bed Systems in Wisconsin

- **Stephensville WWTF**
- **Marion WWTF**
- **Bear Creek WWTF**
- **Brillion WWTF**
- **Sherwood WWTF**
- **Kewaunee WWTF**
- **Ephraim WWTF**
- **Egg Harbor WWTF**
- **Wittenberg WWTF**
- **Danbury (Joint Water Quality Commission)**
- **Bayfield (Greater Bayfield WWTP Commission)**
- **Washburn WWTF**
- **Crandon WWTF**
- **Lomira WWTF**
- **Belgium WWTF**
- **Abbotsford WWTF**
- **Arcadia WWTF**
- **Red Cliff (EPA)**
- **Oneida (EPA)**

Construction of the Reed Beds

- Typically Reed Beds are constructed with concrete side walls
- PVC liner is used to make the beds impermeable
- Perforated underdrain system usually connected to the head of the plant
- Less than two feet of gravel and sand
- 4 feet of freeboard \pm
- Biosolids distribution system

Typical Reed Bed Construction



SECTION

SCALE: 1/4" = 1'-0"

2
30





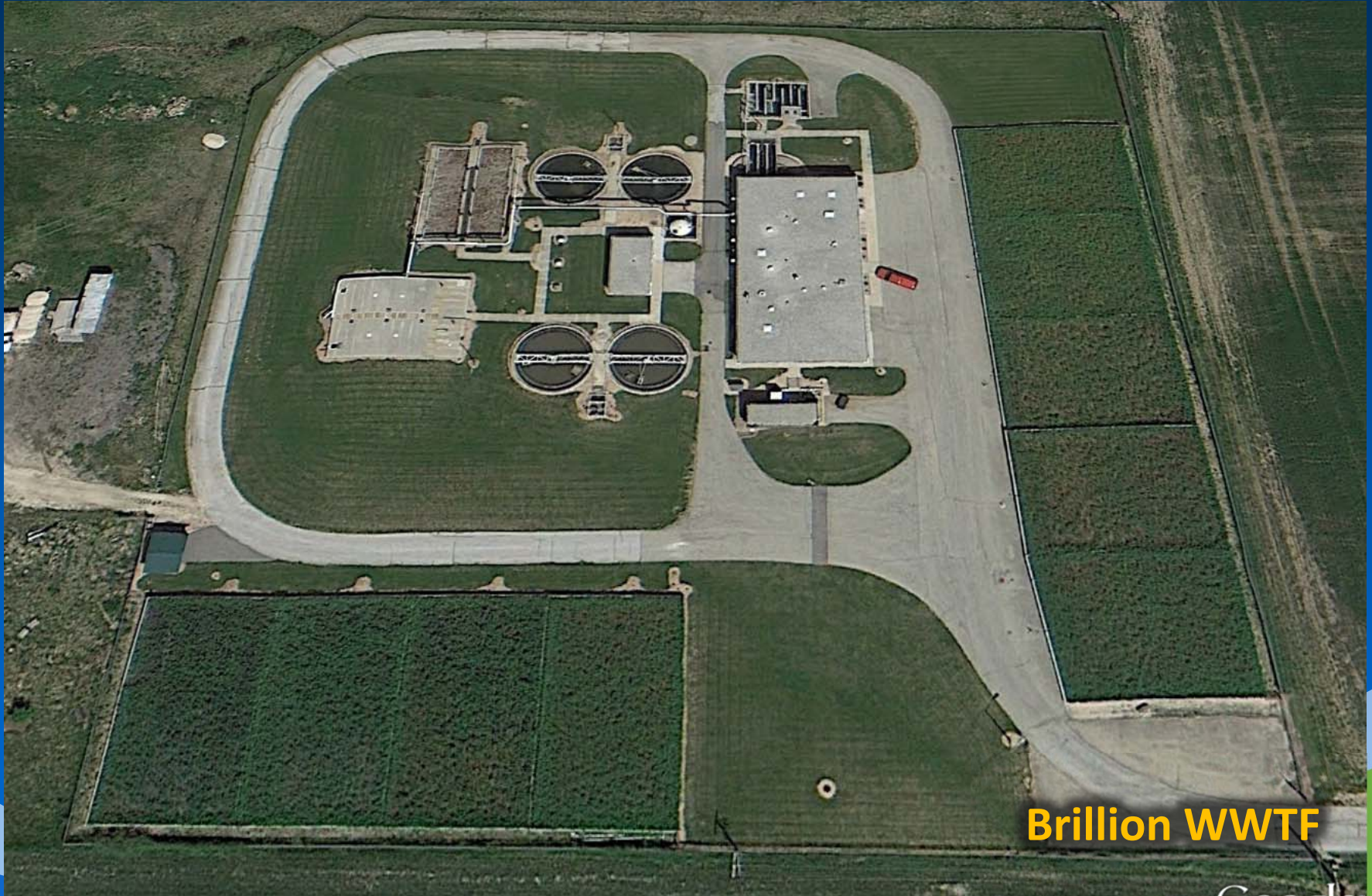


Typical Design Criteria

- **Hydraulic Loading**
 - 20-50 gal/ft²/yr
 - Depends on type of sludge, climate, etc.
 - For Brillion: 30 gal/ft²/yr

- **Provide adequate liquid sludge holding to hold for 3-4 weeks in winter**

- **Reed Beds take up a lot of land**



Brillion WWTF



Sherwood WWTF

Root System Phragmites (Common Reed)

Extensive root structure creates an environment for diverse and active microflora

- Microflora continually help to degrade the volatile solids

Root structure enhances hydraulic conductivity and drainage of supernatant and water from the biosolids

Physical Characteristics of Phragmites

Rhizome and emergent stalk has a system of nodes

When nodes are engulfed by biosolids, they form secondary root system

Secondary root system provides enhanced attachment sites for microflora and aids in dewatering





Advantages of the Reed Bed System

- **Minimal operation and maintenance costs**
- **Requires no removal of biosolids for seven to ten years**
- **Significant volume reduction and volatile reduction of biosolids**

Planting of Phragmites

- **Planting season from mid-April to early May**
- **Watering is required for a period of 4-8 weeks after planting, depending upon season**
- **Application of Biosolids within 4-6 weeks after planting**



Root Stock





Harvesting of the Reed Beds

Harvesting is normally done in the winter when the biosolid layer is frozen

- Provides firm footing
- Plants are dormant

Harvesting can be completed by several methods

- Use of sickle bar mower
- Weed trimmer with metal blade
- Burning

Why Do We Harvest the Reeds?

Significant biomass (10 to 13-foot high plants) will dramatically add to the sludge blanket, if not removed

Although metal uptake by plants is not significant, removal of the reeds helps to lower metal levels in the accumulated biosolids layer over time

- Reeds have the greatest affinity for copper and zinc



Harvesting (Continued)

- **Nine to twelve inches of plant stalk should be left after harvesting**
- **Remaining stalk is dead plant material, which will not renew itself**
 - Important conduit for air to the rhizome which promotes new growth the following season
 - Creates hydraulic conductivity promoting drainage during the winter

Disposal of Harvested Material

- **Ways to dispose of reed stalks**
 - Composting on-site
 - Burning
 - Disposal to landfill

Evacuation of Reed Beds

- Eventually biosolids will accumulate to a depth of 3 to 3 1/2 feet
- Bed are then taken out of service for six months, starting in the fall
- This allows time for the biosolids to dry and degrade
- Following six month down time, water content becomes as low as 50%

Reeds After Evacuation

- **Reeds will regenerate as a result of the undisturbed underlying root structure**
- **Beds need to be watered following biosolids removal**

City of Brillion Reed Bed Evacuation

- **Reed Beds constructed in 2000**
 - Number of Beds 9
 - Dimensions 52 ft. x 90 ft.
- **City on a schedule to empty 3 beds per year**
- **2013 – emptied the first 3 beds**
- **Beds allowed to rest for 6-7 months**
- **Sludge hauled to Hickory Meadows landfill**
- **Estimated total cost will be \$188,000**









**Keep 5" of Sludge to
Protect Root Structure**



