

Treatment Wetlands for Water Quality





Metropolitan Water Reclamation District of Greater Chicago and V3 Companies





- Jennifer Maercklein, P.E., CFM
 Water Resources Project Manager
 V3 Companies
- Tom Slowinski
 Vice President, Wetlands and Ecology
 V3 Companies
- Jonathan Grabowy, P.E.
 Senior Civil Engineer
 Metropolitan Water Reclamation District



Presentation Agenda

- Treatment Wetlands: What Are They?
- Treatment Wetlands: Why?
- Case Studies (MWRD Demonstration Projects)
- Design Considerations
- Nutrient Removal Potential
- Permitting Considerations



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Treatment Wetlands: What Are They?

TREATMENT WETLAND SYSTEM ILLUSTRATION



- Constructed Wetlands
- Use biogeochemical processes that occur naturally to remove nutrients and other constituents of concern
- Design Features
 - Series of treatment cells, often terraced
 - Hydraulic controls to optimize retention time



- This presentation will focus on municipal wastewater (MWRD)
 - Other applications:
 - Urban Stormwater
 - Industrial
 - Landfill
 - Mine water
 - Agriculture



Treatment Wetlands: Why?

MWRD Basis for Treatment Wetlands

- Nutrient standards for WRPs pending by IEPA
 - Phosphorus discharge limits to reduce Hypoxia in Gulf
- MWRD considering alternatives to supplement conventional biological and chemical WRP nutrient removal.
- In 2007, decided on pilot studies to test treatment wetland nutrient removal under local conditions at two underutilized locations.



Treatment Wetlands: Why?

MWRD Basis for Treatment Wetlands

 Treatment wetlands must provide a least-cost lifecycle alternative to supplement conventional nutrient removal.

Additional benefits

- Reduced energy and chemical use
- Overall positive environmental impacts
 - Increase wildlife habitat
 - Increase wetland acreage
 - Improve water quality in watershed
 - Provide education and recreational opportunities (not included in current demonstration projects)



Treatment Wetlands: Case Studies

- MWRD Demonstration Projects:
 - Centennial Trail Prairie-Marsh
 - Powerhouse Marsh
- Each site creates approximately 30 acres of wetland.
- MWRD WRPs meet current discharge limits.
 - Treatment Wetlands to demonstrate further nutrient reductions in anticipation of future regulation.
 - Each wetland is "fed" by water from Chicago Sanitary and Ship Canal – <u>NOT effluent</u>.



Treatment Wetlands: Case Studies





Centennial Trail Prairie-Marsh

- 175 acres
- Approximately 2 mi long
- Between Des Plaines River and Sanitary and Ship Canal
- Railroad berm/bike trail on west
- Highly disturbed on east side
- 92.2 Ac. wetland (53%)
- 89 Ac. high-quality wetland





Centennial Trail Proposed Design

- Avoid high quality wetlands
- Three paths of three cells in series (9 cells total)
- Pump station
- 1.74 MGD (2.7 cfs)
- 1.21 Ac. wetland impact
- 29.17 Ac. treatment wetlands





Powerhouse Marsh

- 65 acres
- Between Des Plaines River and Sanitary and Ship Canal
- Downstream of Lock & Dam
- Elevation drop in Canal
- Highly disturbed on east side
- 18.4 Ac. wetland (28%)





Powerhouse Marsh Proposed Design

- Two parallel flow paths
 - 5 cells in series
 - 3 cells in series
- Gravity-fed system
- 8.96 MGD (13.9 cfs)
- 10.04 Ac. wetland impact
- 28.13 Ac. treatment wetland





Design Considerations at Both

- Individual Cell Layout for optimum length:width ratio of 4:1
- Elevation drop between cells based on head loss through system
- Distribution ditches to minimize "dry" zones and short circuiting
 - Water to pass through as much vegetation as possible
 - Achieve greatest reduction in nutrient loading
- Optimize footprint given any physical constraint





Nutrient Removal Potential

- Both sites located downstream from Lemont WRP
 - "Nutrient Farming" or "Credit Trading"
 - Compute regulatory requirements at plant
 - Demonstrate that equivalent load reductions occur at wetland to meet regulatory requirements





Permitting Considerations

- City of Crest Hill & Will County
 Stormwater, Floodplain, Wetlands, SE/SC
- Illinois Department of Natural Resources
 - Threatened & Endangered Species
 - Floodway Construction
- Illinois Environmental Protection Agency
 - Section 401 Water Quality Certification
- U.S. Army Corps of Engineers, Chicago District
 - Section 404 Individual Permit



- Multiple pre-application meetings
- Permitting options
 - RP 5, Wetland & Stream Restoration (45 days)
 - Authorizes the restoration, creation or enhancement of wetlands
 - Flexible wetland impact limits, mitigation requirements, etc
 - Requires net gain in aquatic resource functions & values
 - Individual Permit (1 year)
 - Formal public notice
 - Additional agency review
- Wetland mitigation requirements
 - Mitigation credit for treatment wetlands? (50% v. 100%)
 - Wetland mitigation functions?
 - Performance standards?



Wetland Permitting

- Individual permit application, January 2009
- Wetland mitigation design
 - 11.25 Ac. wetland impact
 - 21.43 Ac. mitigation credits required (1.5:1 & 2:1)
 - 57.3 acres of wetland created (net gain of 46.05 acres)
 - Emergent vegetation
 - 50% credit proposed = 28.65 credits
 - Mitigation ratio = 2.55:1
- Mitigation functions
 - Water quality
 - Wildlife habitat



- Treatment Wetlands provide a means to remove nutrients from WTP effluent
- Can be a cost-effective, sustainable solution toward meeting regulatory requirements
- Can provide "ancillary" benefits
 - Increased wetland acreage
 - Wildlife habitat
 - Recreational uses & educational opportunities (not part of MWRD projects)

