Treated Wastewater Disposal by Spray Irrigation in MD

Wastewater Workgroup

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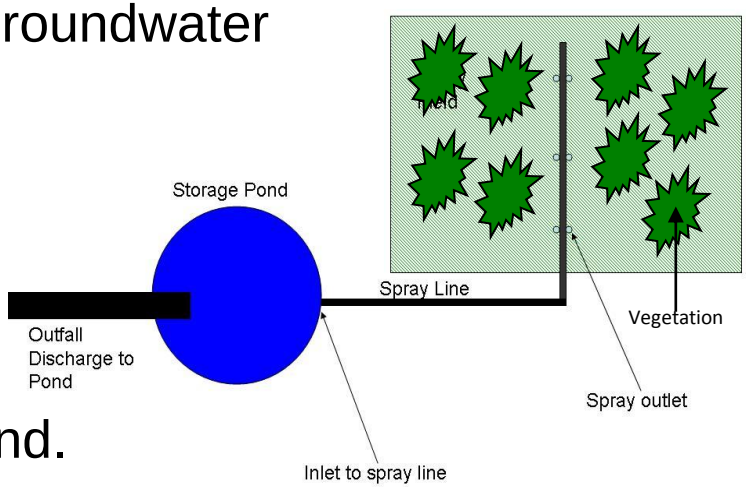
What is Spray Irrigation?

Spray Irrigation: an alternative method of wastewater treatment and disposal

Benefits

1. Nutrients, BOD, TSS, bacteria greatly reduced through infiltration
2. Nutrients removed can be available to support vegetation growth
3. Renovated wastewater recharges the groundwater



Process:

- WWTP effluent discharged to storage pond.

- Wastewater in pond then used to irrigate fields.

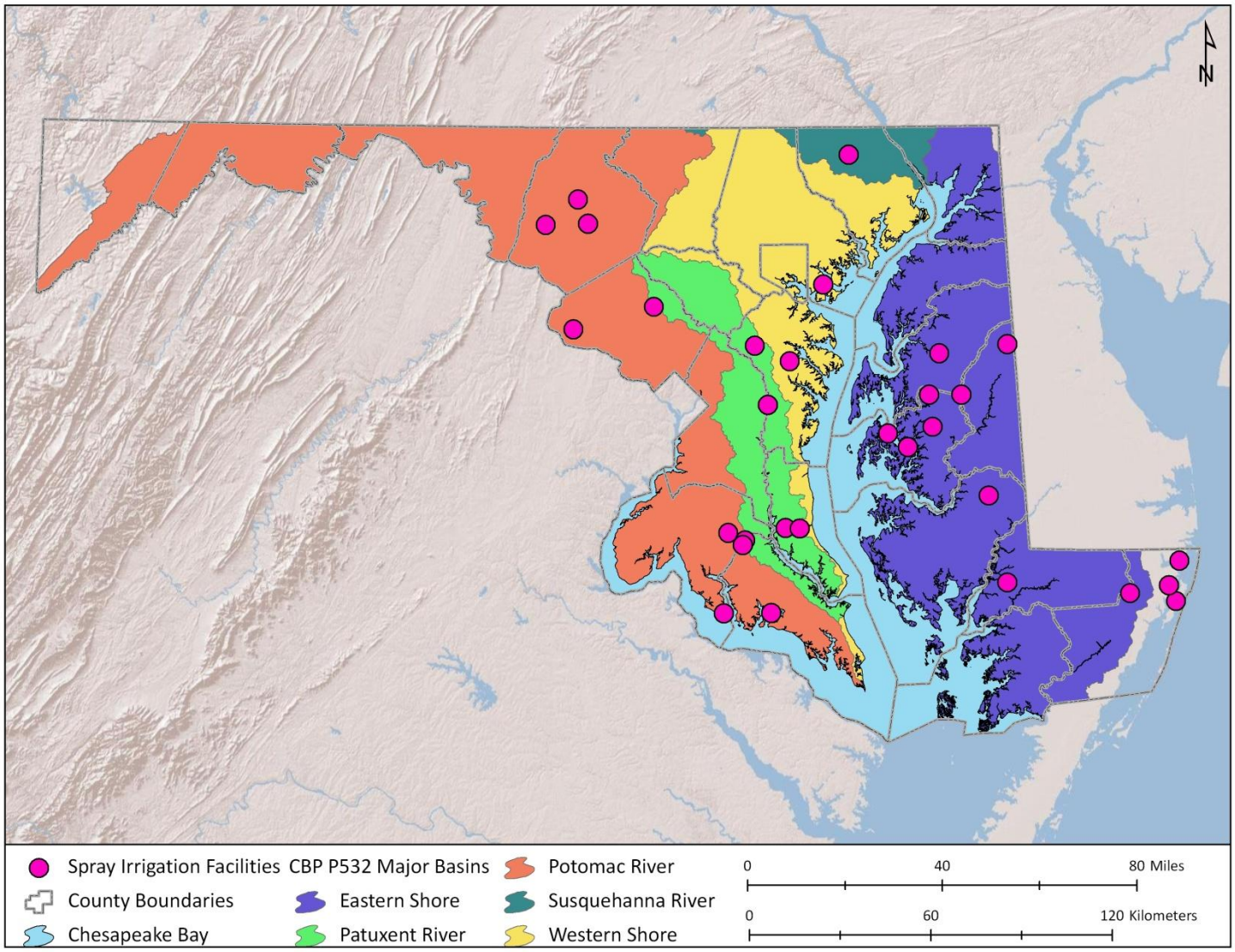
Facilities – 33 in MD

Permit #	Facility Name	County	Design Flow (g/day)	Irrigation Rate (in/wk)	Spray Field Size (acres)
06DP1997	MES - CROWNSVILLE HOSPITAL WWTP	ANNE ARUNDEL	300,000	2	46
05DP2634	U.S. ARMY - FORT GEORGE G. MEADE	ANNE ARUNDEL	150,000	Turf Grass Comsumptive Rate	120
05DP3113	SPARROWS POINT COUNTRY CLUB	BALTIMORE	144,000	Turf Grass Comsumptive Rate	130
05DP2705	PRINCE FREDERICK WWTP	CALVERT	450,000	1.4	99
05DP3309	PRINCE FREDERICK WWTP NO. 2	CALVERT	300,000	1.7	54
07DP1264	CAROLINE ACRES MOBILE HOME COMMUNITY	CAROLINE	20,000	1	10
	RIDGELY	CAROLINE	200,000	1.5	45
	MANCHESTER WWTP	CARROLL	500,000	2	65
05DP2211	COBB ISLAND WASTEWATER FACILITY	CHARLES	158,000	2	25
06DP2590	SOUTHERN MARYLAND PRE-RELEASE UNIT	CHARLES	20,000	1.6	3
07DP2801	HURLOCK WWTP	DORCHESTER	700,000	1.5	128
	EMMITSBURG	FREDERICK	365,000	0.5	210
06DP2833	CLUSTERED SPIRES GOLF COURSE	FREDERICK	45,000		40
05DP3336	LYNFIELD FARM FAIRGROUND	FREDERICK	3,900	0.75	1.8
04DP3480	MIDDLETOWN EAST WWTP	FREDERICK	58,000		44
03DP1014	HABONIM CAMP ASSOCIATION	HARFORD	5,000	0.5	2.7
05DP3295	BLUE MASH GOLF COURSE	MONTGOMERY	5,000	Turf Grass Comsumptive Rate	
03DP2896	POOLESVILLE GOLF COURSE WWTP	MONTGOMERY	8,000	Turf Grass Comsumptive Rate	
03DP1499	PATUXENT RIVER 4-H CENTER FOUNDATION, INC.	PRINCE GEORGE'S	16,000	1.5	4.2
05DP3323	CENTREVILLE WASTEWATER IRRIGATION FACILITY	QUEEN ANNE	540,000	0.3-2.0	223.3
05DP1282	THE CENTREVILLE NATIONAL BANK OF MARYLAND	QUEEN ANNE	1,000	2	0.2
	CHARLOTTE HALL	ST MARY'S	20,000	1	6.1
07DP1411	CHARLOTTE HALL CENTER, INC. WWTP	ST MARY'S	56,000	1.5	11.7
07DP1587	ST. CLEMENT'S SHORES WWTP	ST MARY'S	100,000	1	47
05DP1448	CALHOON MEBA ENGINEERING SCHOOL	TALBOT	24,000	0.5	12.4
07DP2713	HOG NECK GOLF COURSE	TALBOT	60,000	Turf Grass Comsumptive Rate	46
04DP2038A	MARTINGHAM UTILITIES WWTP & WTP	TALBOT	66,800	Turf Grass Comsumptive Rate	46
08DP3406	THE PRESERVE AT WYE MILLS	TALBOT	20,000	1.4	15.3
07DP2250	MES - POPLAR HILL PRE-RELEASE WATER/WASTEWATER	WICOMICO	30,000	2	6.8
06DP2608	ASSATEAGUE POINTE WWTP	WORCESTER	64,000	2	9.2
10DP2864	BERLIN WWTP - SPRAY IRRIGATION SITE	WORCESTER	750,000	0.75-2.0	180
06DP3155A	LIGHTHOUSE SOUND WWTP	WORCESTER	38,000	Turf Grass Comsumptive Rate	32.7
06DP2710	RIDDLE FARM WWTP	WORCESTER	197,000	2	192

Irrigation rate based on amount required to maintain turf grass ~ 0.25 in/week

Irrigation rate based on type of vegetation, soil, to a max of 2 in/week.

Facility Locations



Typical Permit Requirements

- Monitoring
  - Effluent
    - At discharge from pipe to storage pond
  - Groundwater
    - Monitoring wells throughout spray fields
  - Surface Water
    - Stations in surface waters adjacent to spray fields
  - Flow
    - Flow out of storage pond to spray lines (i.e., indicative of irrigation)
- Buffers
  - Between spray fields and surface waters/adjacent properties
- Storage
  - Mostly 60 – 90 days (some as high as 5 months)
- Irrigation
  - No irrigation of non-vegetated soils (i.e., no irrigation during winter months - exceptions)
  - No irrigation when soils are frozen, during rain events, during high winds, or when the soils are saturated
  - No irrigation if less than 2 ft. vertical buffer of unsaturated soil

Typical Permit Limits

- Effluent: Three levels of pre-application treatment requirements

Parameter	Class I	Class II	Class III
BOD	70	10	10
TSS (mg/l monthly average) Or Turbidity in NTU	90	10	Turbidity 2 NTU
Fecal Coliform (MPN/100 ml) monthly geometric mean	200	3	2
pH	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5

Typical Permit Limits

- Groundwater
  - NO3: 10 mg/l
  - NO2: 1 mg/l
  - TKN: monitoring required without limit
  - TN: 10 mg/l
  - pH: monitoring required without limit
  - PO4: monitoring required without limit
  - TDS: 500 mg/l
  - Chlorides: 250 mg/l
  - Fecal Coliform: Non-detect

- Both Effluent and Groundwater reporting through DMR

Modeling Approach/Key Assumptions

- Delivered Load to Surface Water

(Nutrient Load applied – nutrient plant uptake) x Delivery factor)

[(Flow x Concentration)-Plant Uptake] x (Delivery Factor)

- Delivery Factor
  - Critical Area, within 1,000 ft., and outside of 1,000 ft.
    - 80%, 50%, and 30% delivery
  - Same as septic system delivery factors
- Irrigation Rate/Plant Uptake
  - Varies depending on vegetation, soils, etc. - from 0.25 in/week to a maximum of 2 in/week
  - Varies depending on type of crop

Importance for Model

- Small number of facilities; small load
  - ~ 100,000 – 150,000 lbs of Nitrogen delivered to MD surface waters

  So why important?

  – Local specificity of Phase 6 Model
    - ✓ Modeling local water quality
  – Number of WWTPs converting to spray irrigation expected to increase

    Why? Scarcity of nutrient allocations
    - ✓ To meet demand capacity growth while meeting local and Bay WQ
    - ✓ Limitations set in permit too stringent for the permittee to meet

Contacts

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Groundwater Permits Division

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