

*Metropolitan Water Reclamation District of Greater Chicago*  
*Protecting Our Water Environment*

# **Overview of Rules and Guidelines Governing Beneficial Reuse of MWRD Biosolids**

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*Workshop on Microconstituents and Ecological Impacts of Biosolids and Effluent  
Reuse June 26, 2008*

# Objectives

**Provide an overview of rules and guidelines used in MWRD's local beneficial reuse program**

- 1. Goals of the rules and guidelines**
- 2. Basis - How were they developed**
- 3. What are the limits and guidelines**
- 4. How MWRD biosolids compare and comply**

# Biosolids Rules and Guidelines

## Federal

USEPA 40 CFR Part 503 Regulation

## State

IEPA (35 IAC PART 391) – Design Criteria for land application of sludge

## Local/Project

1. Chicago DOE - Tiered Approach to Corrective Action Objectives (TACO)
2. Calumet Ecotoxicological Protocol (Ecotox)

# USEPA 40 CFR Part 503 Regulation

## Overall Goal

- Protect public health and the environment from reasonably anticipated effects of pollutants that may be present in biosolids

## Basis

- Comprehensive multi-media risk assessment using method approved by a USEPA Science Advisory Board

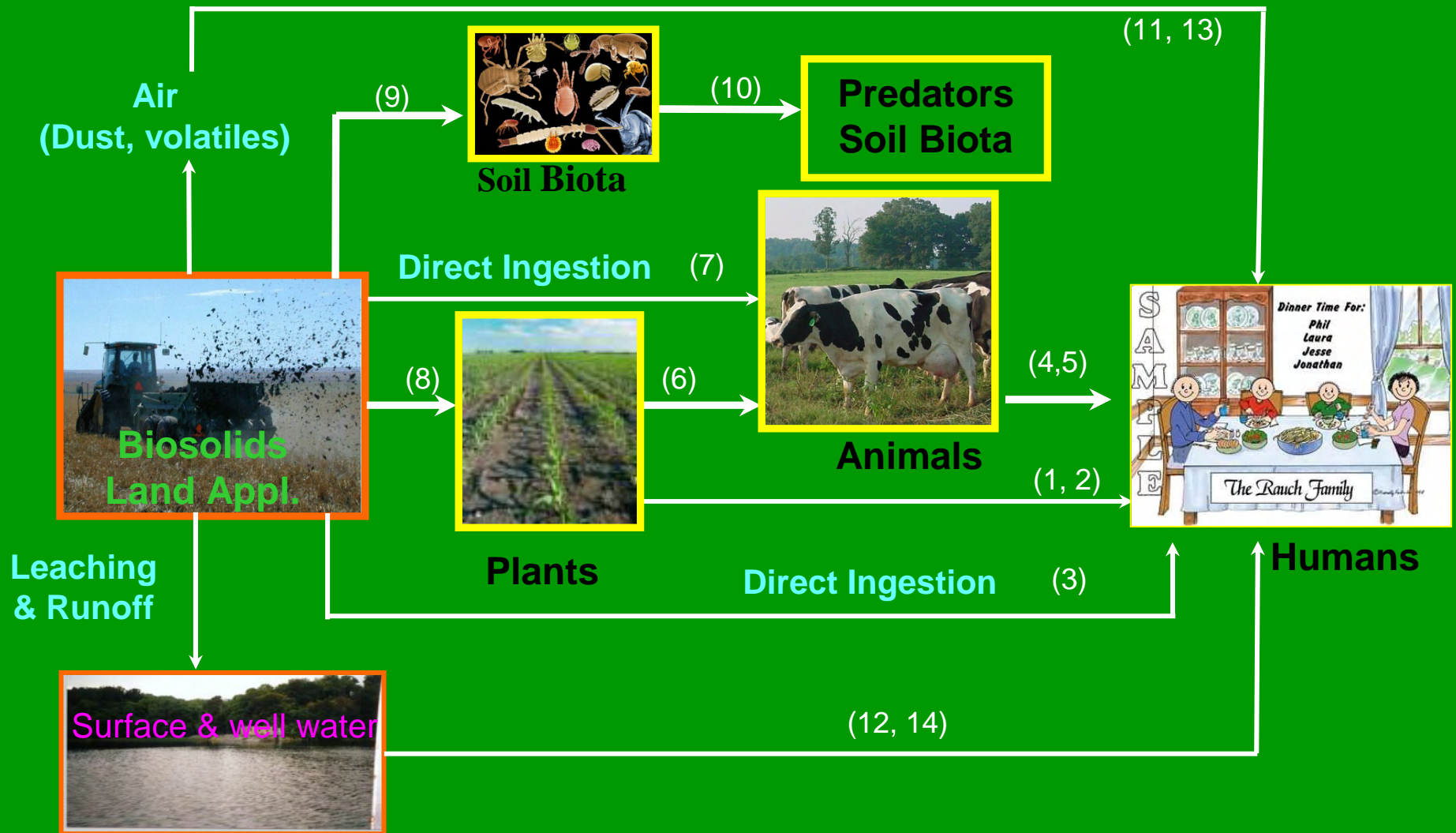
# **USEPA 40 CFR Part 503 Regulation**

## **Comprehensive Multi-media Risk Assessment Model**

### **Risk Assessment Model Steps**

- 1. Determine Hazard - Can pollutant harm humans and/or the environment?**
  - initial list included 200 organic and inorganic constituents**
- 2. Exposure – Who, how, and extent of exposure**
- 3. Dose response – What happens when exposure occurs**
- 4. Risk – likelihood of adverse effects due to exposure**  
**Risk level – 1 in 10,000 cancer risk**

# USEPA Part 503 Risk Assessment



# USEPA 40 CFR Part 503 Regulation

## Final Rule

- Only nine trace metals (Cr omitted afterwards)
  - Trace metal content in biosolids
  - Trace metal loading rates
- Pathogen content
  - Class A criteria (almost pathogen free)
  - Class B criteria
- Vector attraction Reduction
- Biosolids meeting lowest conc. limits, Class A pathogen and VAR criteria are defined as **exceptional quality (EQ)**

## **USEPA 40 CFR Part 503 Regulation**

**Other potential pollutants not regulated because:**

- Compounds were banned or longer used**
- Concentrations in biosolids and frequency of detection in biosolids does not pose significant risk**



## **USEPA 40 CFR Part 503 Regulation**

### **How does MWRD air-dried biosolids compare?**

- All lagoon-aged air-dried biosolids are EQ
- Trace metal content much lower than EQ limits, achieved through pretreatment program
- Class A criteria met through low-cost processing certified by USEPA as a process to further reduce pathogen (PFRP)
- VAR achieved through processing (volatile solids reduced by >38%)

# Annual Mean Levels of Trace Metals in MWRD Biosolids Compared to USEPA Part 503 EQ Limits

Trace Metal	1980	1990	2000	2007	Part 503 EQ Limit
	----- mg/kg -----				
As	nd	nd	8	6	41
Cd	308	92	4	5	39
Cu	1888	426	358	465	1600
Hg	7.7	2.0	0.7	1.0	17
Ni	449	202	42	50	420
Pb	1159	374	125	104	300
Zn	4318	1820	998	909	2800

## **IEPA Part 391 Rule**

- **Title 35 Subtitle C Chapter II Part 391: ‘Design Criteria for Biosolids Application on Land’**
- **Established 1984. Per IEPA, rule is currently being revised**

### **Overall Goal**

- **Establish criteria for transporting, storing and applying biosolids on land in an environmentally acceptable manner**

# IEPA Part 391 Rule

## MWRD Beneficial Reuse Program Compliance

- All users are covered under MWRD's Biosolids Controlled Solids Distribution Permit issued by IEPA
- Complies with limits on loading rates and setback distances from surface waters, potable wells, roads and residence
- IEPA reviews and approves all MWRD projects as specified in the permit

# TACO

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## IAC 35 Part 742

### Program Goal

- Voluntary program for cleanup of contaminated sites enrolled in various remediation programs
- Help to address “how clean is clean”
- Contaminated sites get a no further remediation letter

# TACO

## Limits

- Limits or remediation objectives (ROs) for concentrations of 140+ organic and inorganic constituents
- Many of these were evaluated in Part 503 risk assessment, but were not regulated
- Three tiers of ROs
  - Tier 1 – Residential, Industrial, Commercial
  - Tier 2 - Site specific
  - Tier 3 – Site specific (using factors not available in Tiers 1 and 2)

# TACO

## How Does MWRD Air-dried Biosolids Compare

- The number of TACO compounds and concentrations seem to be decreasing with time
- Of the 140+ parameters only four were above Tier 1 residential ROs
  - Three poly aromatic hydrocarbons (PAHs)
    - Benzo(a)anthracene (BAA)
    - Benzo(a)pyrene (BAP)
    - Benzo(b)fluoranthene (BAF)
  - Arsenic (conc. is < Metro area background)

# TACO Risk Assessment - Biosolids Use at Sites city of Chicago

## Objective

Determine Tier 3 ROs for scenarios that Chicago Park District and CDOE might use biosolids

## Approach

- Max. conc. in soil/biosolids matrix that ensures cancer risk is  $<1$  in 1,000,000
- Use model parameter estimates similar to those for risk assessment done for other Calumet region restoration projects; e.g. Van Vlissingen Prairie



# TACO Risk Assessment Model

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## Land Use Scenarios

Athletic fields, playgrounds, picnic areas, community gardens, parking lots, and park buildings

## Exposed Individuals/Receptor

Children, employees, visitor

## Exposure Routes

Ingestion, dermal contact (no inhalation, since COC are non-volatiles)

# TACO Risk Assessment

## Risk Assessment Outcome

Parameter	Scenario	Receptor	Lowest RO	<u>Biosolids</u>	
				SWRP	CWRP
BAA	Park building	CPD empl.	4.7	2.2	5.7
<b>BAP</b>	<b>Park building</b>	<b>CPD empl.</b>	<b>1.3</b>	<b>2.8</b>	<b>7.3</b>
	<b>Multiuse trails</b>	<b>Rec. Visitor</b>	<b>1.5</b>		
BAF	Park building	CPD empl.	4.7	2.6	6.1
	Playground	Rec. Visitor	5.9		

# TACO Risk Assessment

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## Risk Assessment Outcome

- BAP has the lowest TACO Tier 3 RO controlling biosolids use at CPD parks
- BAP lower in Stickney WRP biosolids than in Calumet WRP biosolids

# TACO Risk Assessment

## Risk Assessment Outcome

- Based on the results DOE require that for properties owned by the city
  - All Stickney WRP biosolids may meet Tier 3 without blending with soil.
  - Calumet biosolids should be used by blending with soil at no more than 30% biosolids by volume.
- The blending ratio requirement is in the range (15 – 30%) MWRD currently recommends for projects where biosolids are used as soil amendment

# Calumet Ecotox Protocol

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**Ecotox Roundtable convened in 2003 for investigating ecotoxicological risk in Calumet Open Space Rehabilitation**

## **Goal**

- **Guidance and standardize approach for site evaluation**
- **Assist in prioritizing contaminated sites for reclamation**
- **Help in design of site rehabilitation**

# Calumet Ecotox Protocol

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## Ecotox Approach

- Determine threshold levels of contaminants in sediment, surface and groundwater for the Calumet Open Space Rehabilitation
- Threshold levels for soil/sediment based on USEPA ecological soil screening levels (SSLs)

# Calumet Ecotox Protocol

## How Does Biosolids Compare

- Concentrations of some metals, PCBs, and pesticides in biosolids are above threshold values
- The nature of the biosolids matrix suggests that data on soluble or leachable concentrations will help to provide a more appropriate evaluation
- Biosolids will not be used at 100% rate, but blended with soil at <20% biosolids by weight.