

Design and Management of CDFs

Effluent and Runoff Quality Assessment

Tab U2

Trudy J. Estes

KEY WORDS: CDFs, Effluent/Runoff Discharge, Testing, Controls, 401 Water Quality Certification

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Topics

- Regulatory definition & requirements
- Environmental concerns
- Tiered approach
- Testing & Modeling
- Controls
- Recap

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Regulatory Definition 33 CFR 323.2

“...the term ‘discharge of dredged material’ ... includes... the runoff or overflow from a contained land or water disposal area...”

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Effluent/Runoff Quality Regulatory Requirements

- General permit considerations
- Clean Water Act – CFR Section 404(b)(1)
- State 401 water quality certification
- Establish requirements for controls or treatment

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CWA Regulatory Provisions

- Water Quality Standards
 - Adopted per 40 CFR 131
 - Narrative or numeric criteria
 - Dissolved or total concentrations
- Initial Mixing
 - As per 40 CFR 230.3(m)
 - Normally expressed as a distance from point of discharge or area around the discharge

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Characteristics Effluent vs. Runoff

- | | |
|--|-------------------------------------|
| • Volume | • Hydraulic/mechanical filling |
| • Duration | • Flow through dikes / filter cells |
| • Character <ul style="list-style-type: none">– SS– Oxidation | |

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Tiered Approach

- Tier 1 - Existing information
- Tier 2 - Partitioning (screening assessment)
- Tier 3 - Testing
- Tier 4 - Risk Assessment

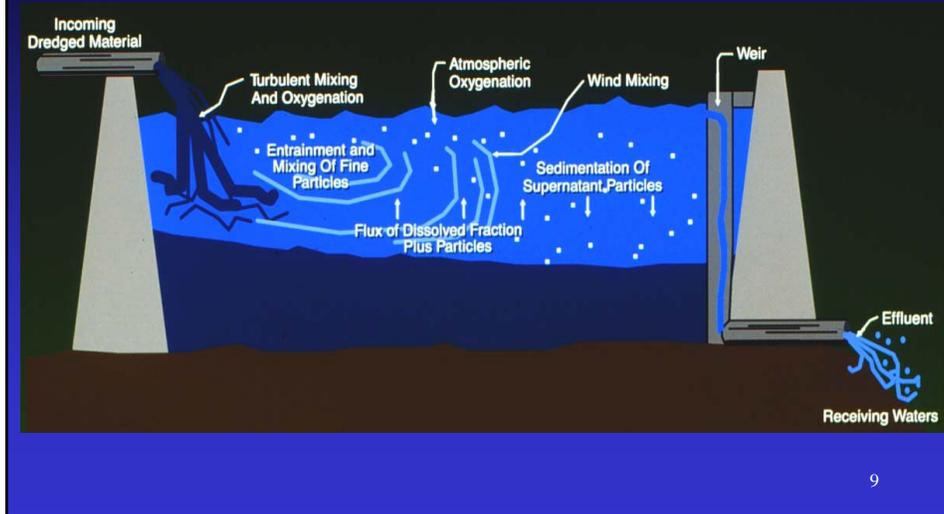
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CDF Effluent/Runoff Quality Guidance

- Effluent
 - Appendix B Inland Testing Manual
 - Appendix B Upland Testing Manual
- Runoff
 - Technical Framework (Updated May 2004)
 - Appendix C Upland Testing Manual

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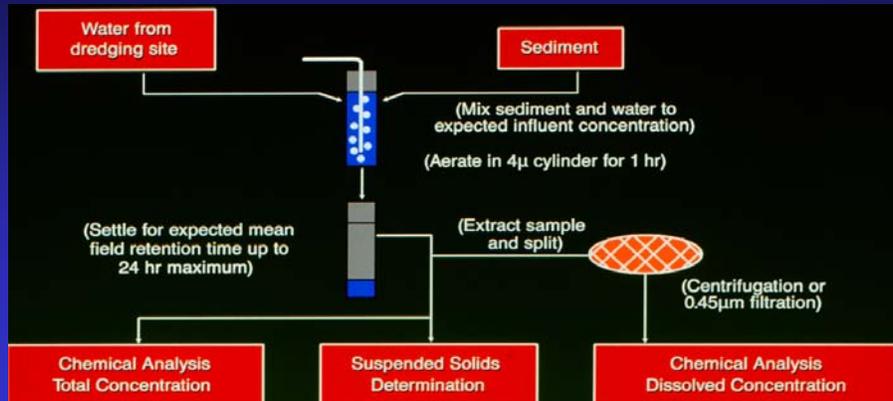
CDF Supernatant Water Interactions



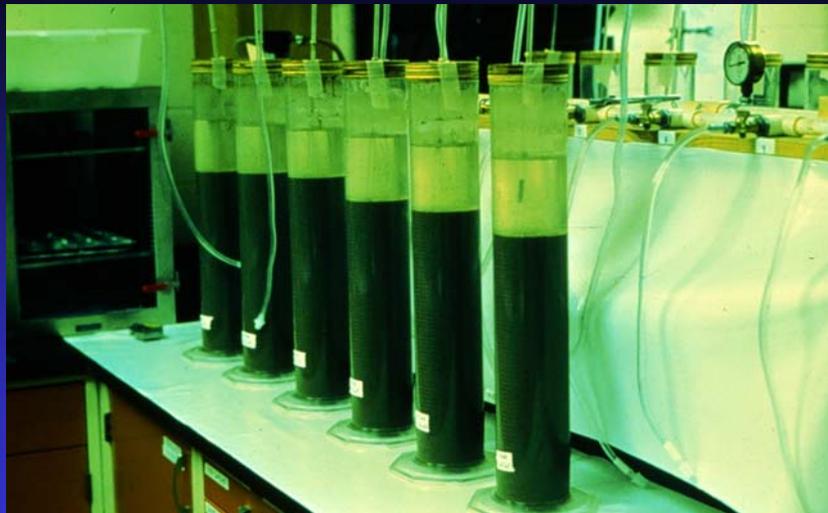
Basis of Effluent Quality Predictions

- Partitioning
 - Theoretical (screening spreadsheets)
- Testing
 - Contaminant mobilization - Modified Elutriate Sedimentation – Column Settling
 - Total = Dissolved + Particle Associated
- Unoxidized conditions

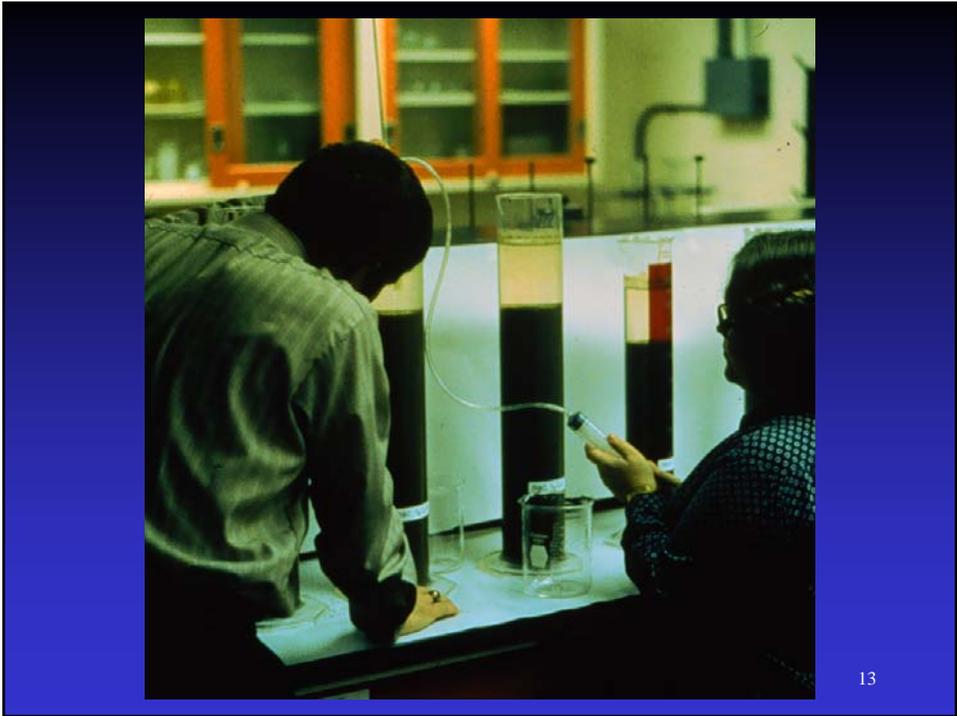
Modified Elutriate Test



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Basis of Runoff Water Quality Predictions

- **Partitioning**
 - Theoretical (screening spreadsheets)
- **Testing**
 - SLRP/RSLs
- **Total and Dissolved**
- **Oxidized and Unoxidized Conditions**

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Simplified Laboratory Runoff Procedure (SLRP) Wet Sediment

- **3 gal sediment**
- **Common laboratory equipment**
- **Dilute to representative TSS**
- **Agitate for one hour**
- **Analyze contaminant concentrations**
 - Filtered for soluble
 - Unfiltered for total

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Field SS Measurements

Sediment	SS, Wet	SS, Dry
Indiana	6600	56
Blackrock	10326	167
Everett	6900	1000
New Bedford	7730	268
Oakland Inner	4447	1686
Oakland Upper	9140	970
Pinole	1500	618
West Richmond	3290	2340
Santa Fe	6240	2130

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SLRP SS Concentrations



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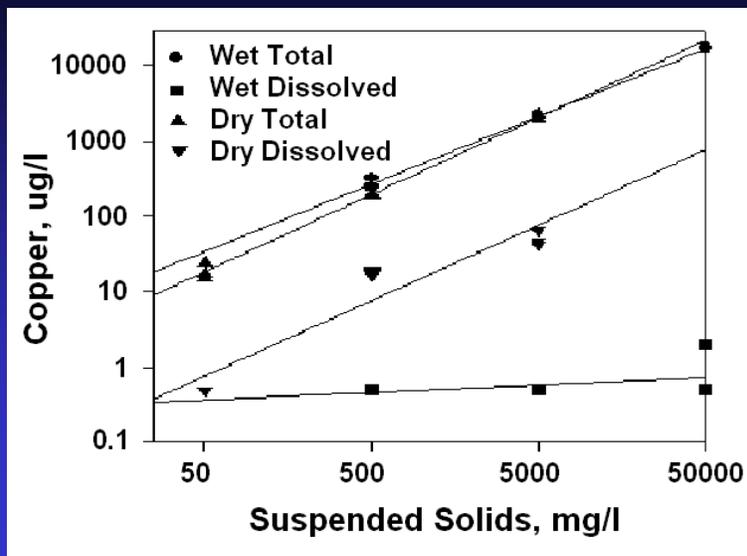
SLRP - Dry Sediment

- Air dry to < 5% moisture and grind
- Oxidize with H_2O_2 , dry and regrind
- Re-slurry at TSS 50, 500, 5,000 mg/l, agitate and extract
- Analyze for total and dissolved contaminants



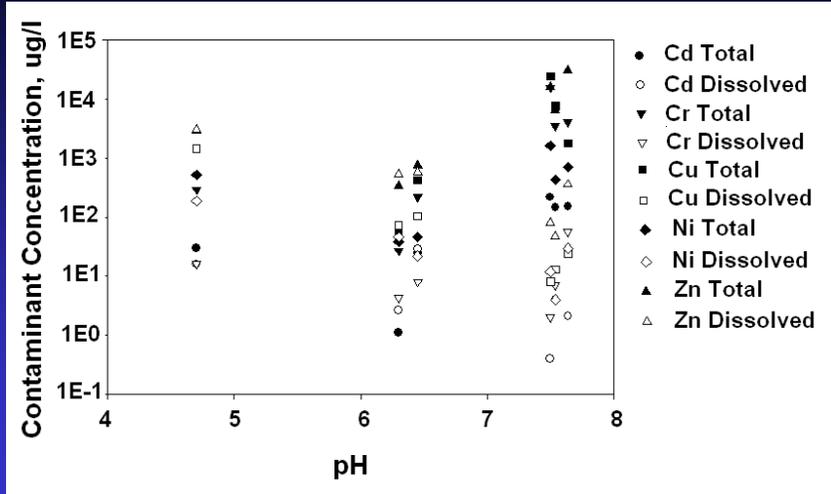
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SLRP Predicted Copper



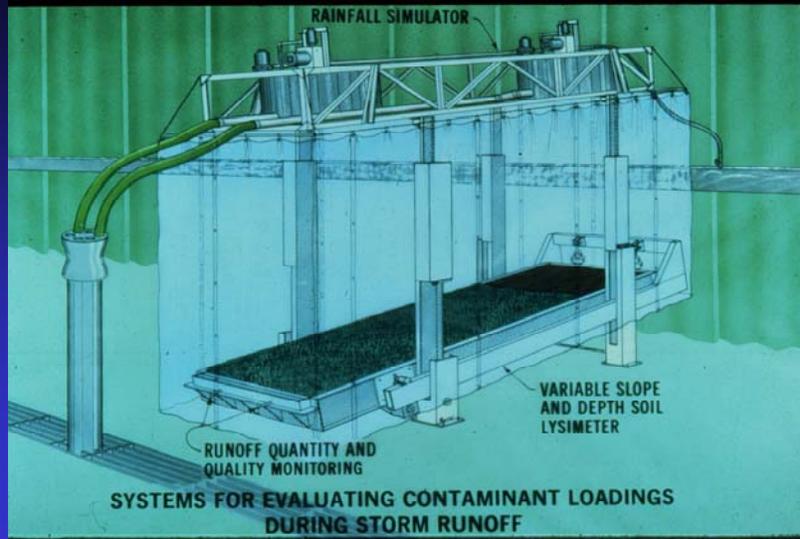
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Paired Field Observations



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RSLS Test



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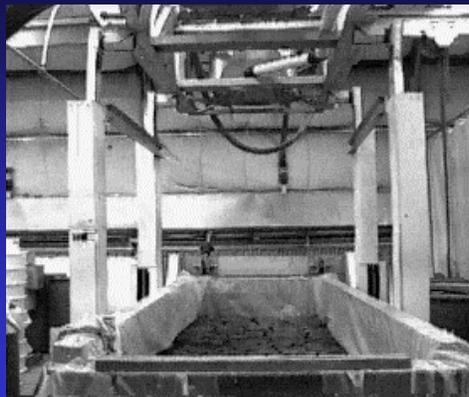
Rainfall Simulator/Lysimeter System (RSLs)

- 600 gal sediment from dredging site
- Specialized equipment
- Rainfall simulation on wet sediment
 - 3 events on consecutive days
 - measure runoff rates, TSS, pH, salinity
- Collect runoff samples, 1 composite/day
- Analyze for soluble (filtered) and total (unfiltered) contaminants

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RSLs Test

- Rainfall rate
 - 5.08 (2 in) cm/hr
- Rainfall duration
 - 30 min
- Runoff rate and TSS
 - 1 to 15 and 25, 30 min
- Chemical analysis
 - composite of 15, 25 and 30 min



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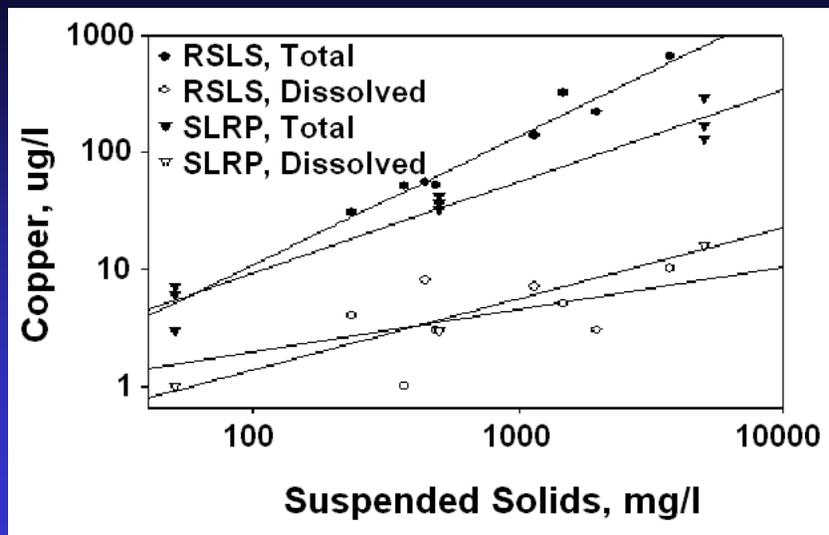
Field Verification & DOER Programs

- RSLs
 - Blackrock Harbor CDF, FVP
- SLRP
 - Jones Island CDF, Milwaukee and Pearl Harbor, DOER



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SLRP vs. Field RSLs



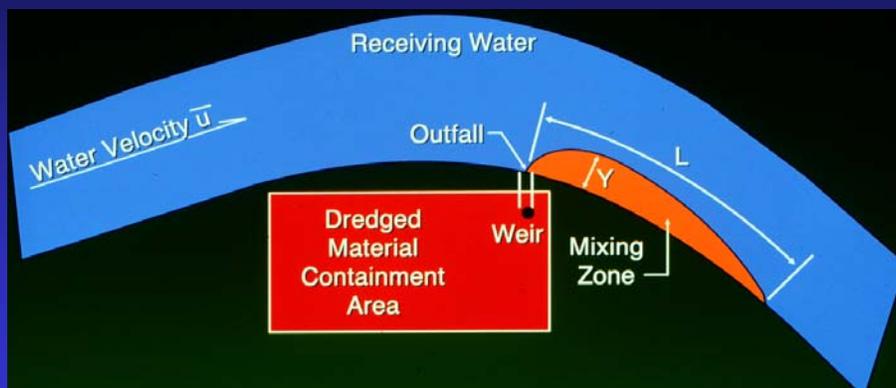
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ADDAMS Effluent Quality Modules

- SETTLE
 - CDF sizing for storage and effluent TSS
- EFQUAL
 - Reduction of modified elutriate data
 - Water quality standards compliance
 - Water column toxicity compliance
- LAT-E
 - Analysis of water column bioassay test to determine toxicity (LC50) of CDF effluent
- EFFLUENT
 - Windows version of the above two modules

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Schematic of a Mixing Zone for a Single Effluent Source



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CDF Effluent Mixing Models

Type of Discharge	Characteristics of Discharge	Nearfield Effects	Hydro-dynamics	Model
CDF Effluent	Continuous	Weak	Steady Uniform	MacIntyre
			Steady Uniform	CDFATE CORMIX
			Non-Steady Non-Uniform	TABS
			Steady Uniform	Dilution Volume Method

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CDF Runoff Quality ADDAMS Programs

- RUNQUAL
 - Compares predicted runoff WQ with standards and determines dilution requirements
- LAT-R
 - Analysis of water column bioassay test to determine toxicity (LC50) of CDF runoff
- RUNOFF
 - Windows version of the above two modules

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Contaminant Controls

- TSS & Particulate Associated Contaminants
 - Operational modifications – retention time
 - Filtration
 - Chemical flocculants
 - Engineered controls – vegetation, capping
- Dissolved
 - Treatment – ion exchange, chemical, biological

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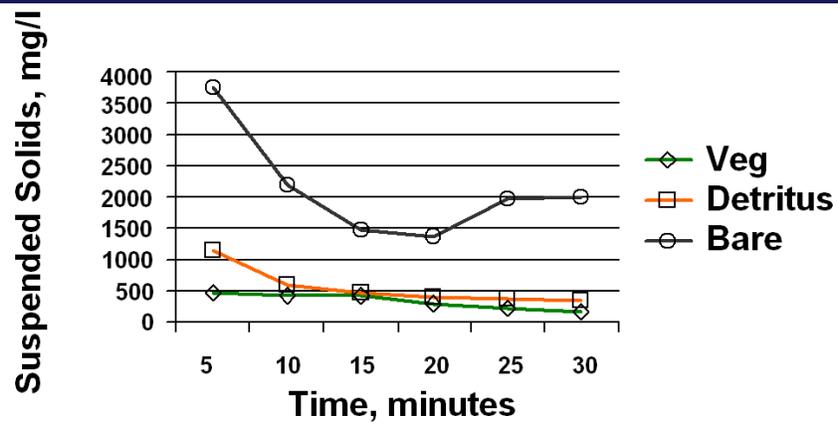


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Runoff SS Controls



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Effluent Quality Summary

- Modified elutriate
 - Accurate
 - Relatively inexpensive
 - Generally conservative
- Controls
 - Operational
 - Treatment

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Runoff Quality Summary

- RSLs
 - Time and material intensive
- SLRP
 - Rapid
 - Conservative
- Controls
 - Engineered
 - Operational
 - Treatment

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