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# Upland Disposal Problem Formulation and Conceptual Model Development

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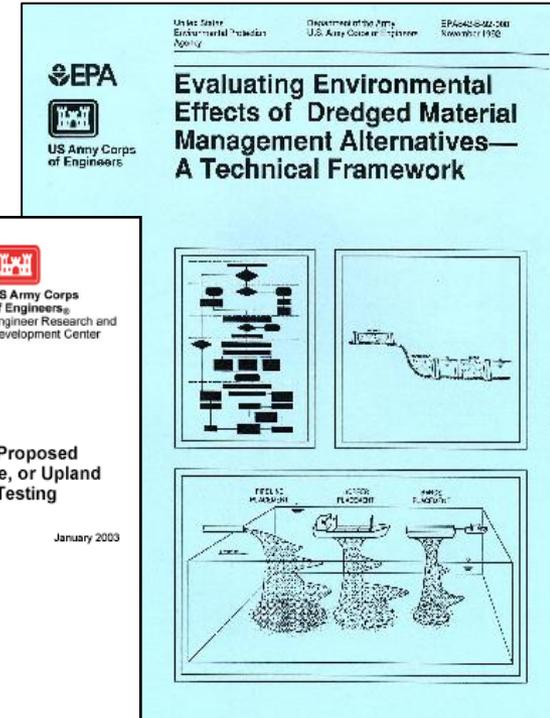
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# Governing Framework

- **Regulatory**
  - **Clean Water Act (CWA)**
- **Technical**
  - **USACE/EPA Technical Framework**
  - **Upland Testing Manual (UTM)**

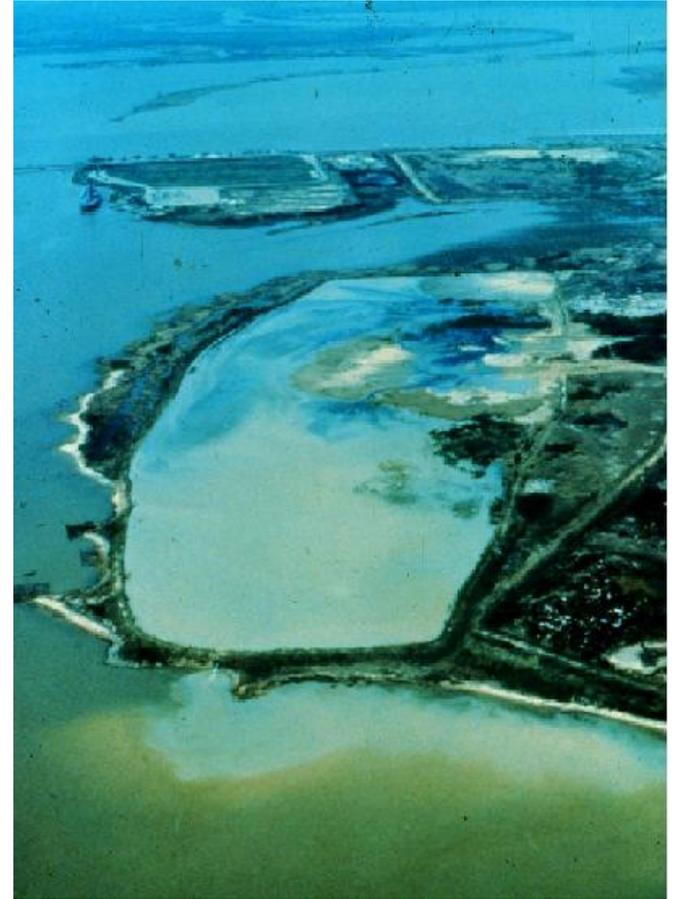


# Clean Water Act

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- **Regulatory (Section 404)**
- **Requires return flow**
  - **Trigger for RCRA Subtitle C Exclusion<sup>1</sup>**
  - **BUT states can still choose to regulate DM as solid waste**

**1 Palermo and Wilson 2000**



# USEPA/USACE Technical Framework

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- **Guidance (not regulatory)**
- **Articulates NEPA, CWA, MPRSA requirements**
- **Alternatives screening**
  - <http://el.erdc.usace.army.mil/dots/pdfs/epa/tech-frame-rev04.pdf>
  - **Open water**
  - **Confined disposal**
  - **Beneficial use**
- **Environmental suitability**



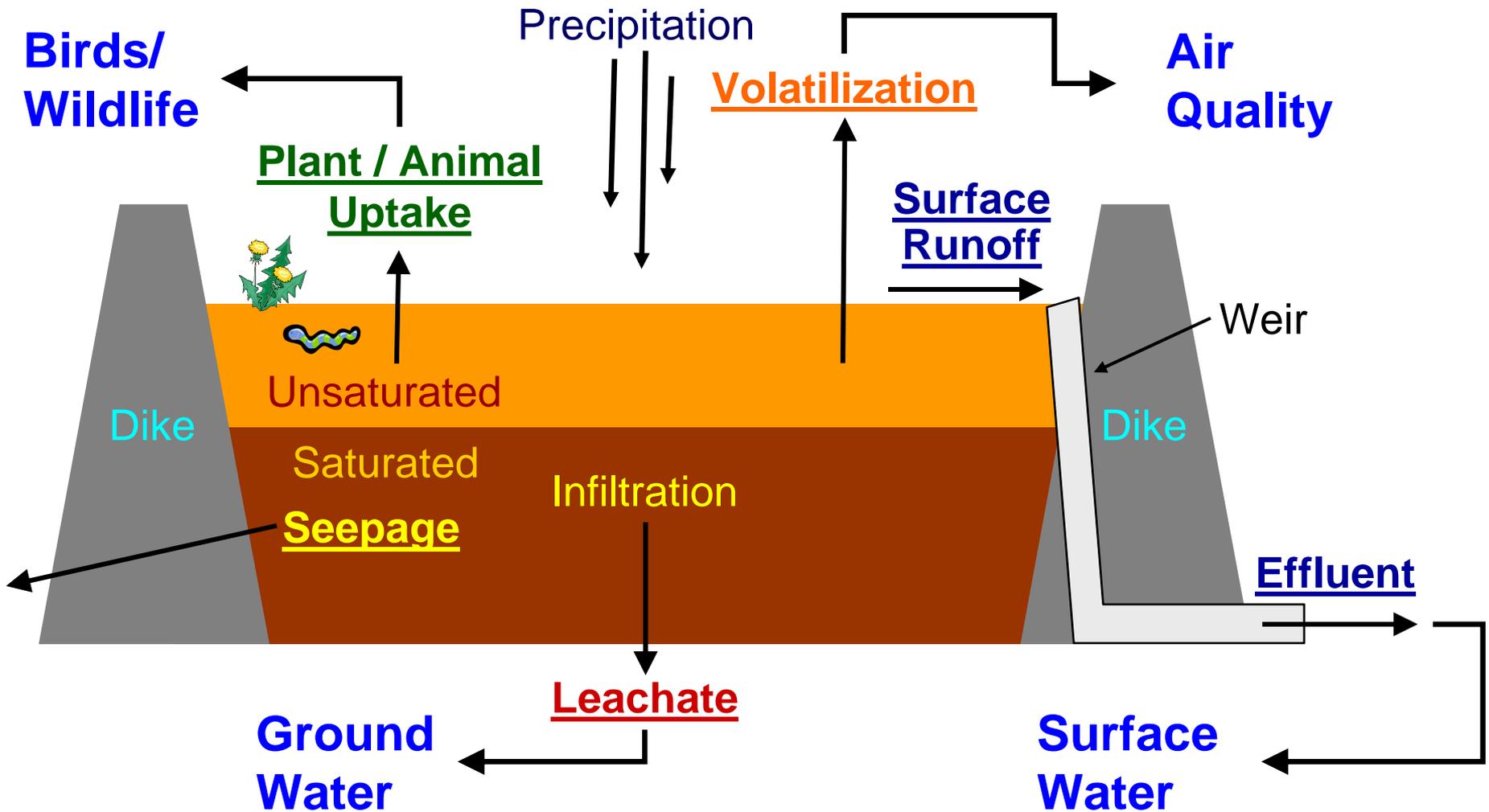
# Upland Testing Manual

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- **Guidance (not regulatory)**
  - <http://el.erdc.usace.army.mil/dots/pdfs/trel03-1.pdf>
- **Concerned with contaminant exposures associated with CDFs**
- **Develop lines of evidence to support decision making**
  - **Management requirements**
  - **Need for controls**
  - **Alternatives analysis**
  - **Evaluation of risk, inform risk management**



# Conceptual Model - Contaminant Pathways



# CDF Pathway End Points

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- **Effluent and Runoff**
  - **WQ Standards and/ or WC Toxicity after Mixing**
- **Leachate**
  - **Applicable WQ Standards after Attenuation (groundwater or surface water)**
- **Volatiles**
  - **OSHA Human Exposure Standards after Dispersion**
  - **Health Based Air Concentration for Acceptable Risk**
- **Plant and Animal Uptake**
  - **Comparison of uptake to Reference Soil**
  - **Comparison to EcoSSL's**



# UTM – A Tiered Approach for Evaluations

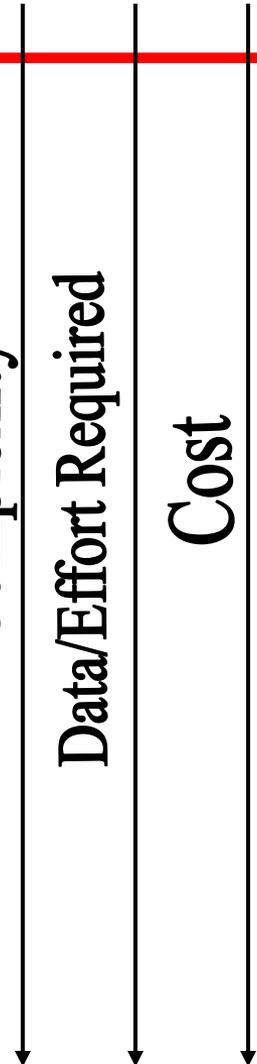
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Tier I	Existing Info
Tier II	Screening Evaluations
Tier III	Effects-Based Testing and Evaluations
Tier IV	Case Specific Studies/ Risk Assessment

Complexity

Data/Effort Required

Cost



# Tier I – Existing Information

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- “Reason to believe”
  - Need for Pathway Evaluations
- **Compile**
  - Available sediment and water chemistry
  - Sediment physical characterization
  - Municipal, industrial, surface water inputs
  - Project info (maintenance vs. new work)
  - Available data from other agencies – diversity studies, tissue sampling
- **Establish Relevant Pathways and Contaminants of Concern**



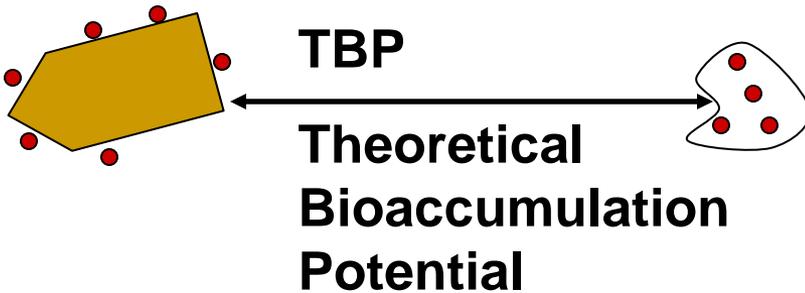
**Proceed to Tier II for relevant pathways**



# Tier II - Screening



Effluent; Runoff; Leachate;  
Volatiles (Henry's Law)



Animal Uptake

Microsoft Excel - UTMHR.xls

R219 = =IF(Q219="NA", "NA", (IF(Q219=1,Q219,Q219\*(Data!\$B\$29))))

Contaminants	Input			SCREENING CRITERIA							Molec Weigh MW lgems
	Actual Bulk Sediment Conc. (mg/kg)	Center Water Conc. (ug/l)	Back-ground Conc. CB (ug/l)	Effluent Marine Chronic Criteria C <sub>u</sub> (ug/l)	Runoff Marine Chronic Criteria C <sub>u</sub> (ug/l)	Leachate Marine Chronic Criteria C <sub>u</sub> (ug/l)	Volatilization Reference Dose (mg/kg-d)	Plant Applicable Screening Criteria (mg/kg)	Animal Applicable Screening Criteria (mg/kg)		
<b>Metals</b>											
95 Aluminum				200.0000	200.0000	200.0000	1.40E-02	NA	NA	3	
96 Antimony				5.0000	5.0000	5.0000	4.00E-04	37	21	12	
97 Arsenic	0.8000	36.0000	0.0000	50.0000	50.0000	50.0000	NA	NA	NA	7	
98 Barium	39.4000			2000.0000	2000.0000	2000.0000	NA	29	NA	13	
99 Beryllium	0.6200			4.0000	4.0000	4.0000	NA	24	110	7	
100 Cadmium	1.1000	9.3000	0.0000	5.0000	5.0000	5.0000	5.00E-04	NA	21	11	
101 Chromium	25.2000	50.0000	0.0000	100.0000	100.0000	100.0000	9.70E-07	NA	61	5	
102 Cobalt	5.2000			NA	NA	NA	NA	NA	NA	9	
103 Copper	54.5000	3.8000	0.0000	1300.0000	1300.0000	1300.0000	NA	NA	NA	6	
104 Lead	50.6000	9.2000	0.0000	0.0000	0.0000	0.0000	NA	NA	20	20	
105 Mercury	0.1500	0.0250	0.0000	0.2000	0.2000	0.2000	8.50E-05	NA	20	20	
106 Nickel	14.5000	8.3000	0.0000	NA	NA	NA	NA	NA	NA	9	
107 Phosphorus	0.1000	0.0000	0.0000	0.1000	0.1000	0.1000	NA	NA	NA	3	
108 Selenium	5.0000	71.0000	0.0000	5.0000	5.0000	5.0000	1.00E-01	109	NA	7	
109 Silver				100.0000	100.0000	100.0000	5.00E-01	NA	120	10	
110 Thallium	0.5000	0.5000	0.0000	5.0000	5.0000	5.0000	NA	NA	NA	20	
111 Tin				NA	NA	NA	NA	NA	NA	11	
112 Vanadium	37.2000			NA	NA	NA	NA	5.42264	NA	9	
113 Zinc	143.0000	86.0000	0.0000	5000.0000	5000.0000	5000.0000	NA	13.81486	NA	6	
<b>EAHs</b>											
114				NA	NA	NA	NA	NA	NA	11	
115				NA	NA	NA	NA	NA	NA	11	
116				NA	NA	NA	NA	NA	NA	11	

Plant Uptake - PUP

Diethylenetriamine-pentaacetic acid (DTPA) Extract



# Tier II Outcomes

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- **Definitive**
  - **WQC met with attainable dilutions/attenuation**
  - **Volatilization exposures acceptable**
  - **Plant and animal uptake levels acceptable**
- **Not definitive**
  - **Contaminants present have no WQC**
  - **Predicted dilution requirements high**
  - **Predicted exposures potentially unacceptable**
  - **Data or model inconsistency**

**Resolve specific issues with Tier III Testing and Evaluations**



# Tier III Testing

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- **Effects Based Testing and Evaluations**
  - **Physical modeling of contaminant exposure effects**
  - **Chemical and Biological Tests**
- **Models for Mixing, Attenuation, Dispersion**

**Tier III test results provide data for Tier IV Risk Assessments**



# Tier IV Case Specific Studies

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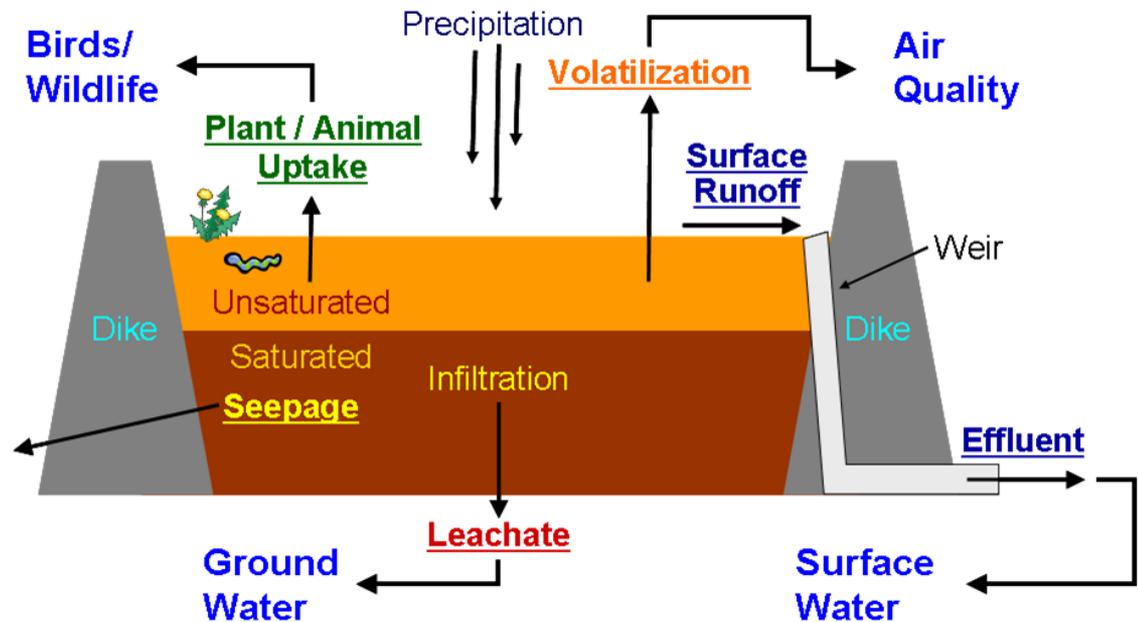
- **Formal quantitative risk assessment**
- **Addresses specific, well-defined questions**
- **Rarely necessary for navigation dredging**
- **Useful if**
  - **Contamination is substantial**
  - **Decision-making information not otherwise available**
  - **The evaluation will provide essential information**
- **Unnecessary use of resources when**
  - **Merely a refinement of Tier III**
  - **Definitive determination unchanged**



# Up Next

- **Pathway Evaluations**

- **Effluent**
- **Runoff**
- **Volatilization**
- **Leachate**
- **Biological**



# References

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- **USEPA/USACE 2004. “Evaluating Environmental Effects of Dredged Material Management Alternatives – A Technical Framework”, EPA842-B-92-008 Revised May 2004, U.S. Environmental Protection Agency, Washington, D.C.**
- **US Army Corps of Engineers 2003. “Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities — Testing Manual”, ERDC/EL TR-03-1, Engineer Research and Development Center, Vicksburg, MS.**
- **Palermo and Wilson 2000. “Corps Of Engineers Role In Contaminated Sediment Management And Remediation”, proceedings of *Contaminated Sediments: Science, Law and Politics*, the 8th Section Fall Meeting, American Bar Associate, Section of Environment, Energy, and Resources, New Orleans, Louisiana, September 20-24, 2000, U.S. Army Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS**

