



Management of Dredged Sediment in Atlantic Canada: Trials and Tribulations

2016 Atlantic Reclamation Conference

November 9, 2016

Overview

- **Background**
- **Characterization of dredged sediment**
 - Common contaminants of concern
- **Challenges**
- **Typical disposal options**
 - At sea
 - On land
- **Measures to mitigate risks**

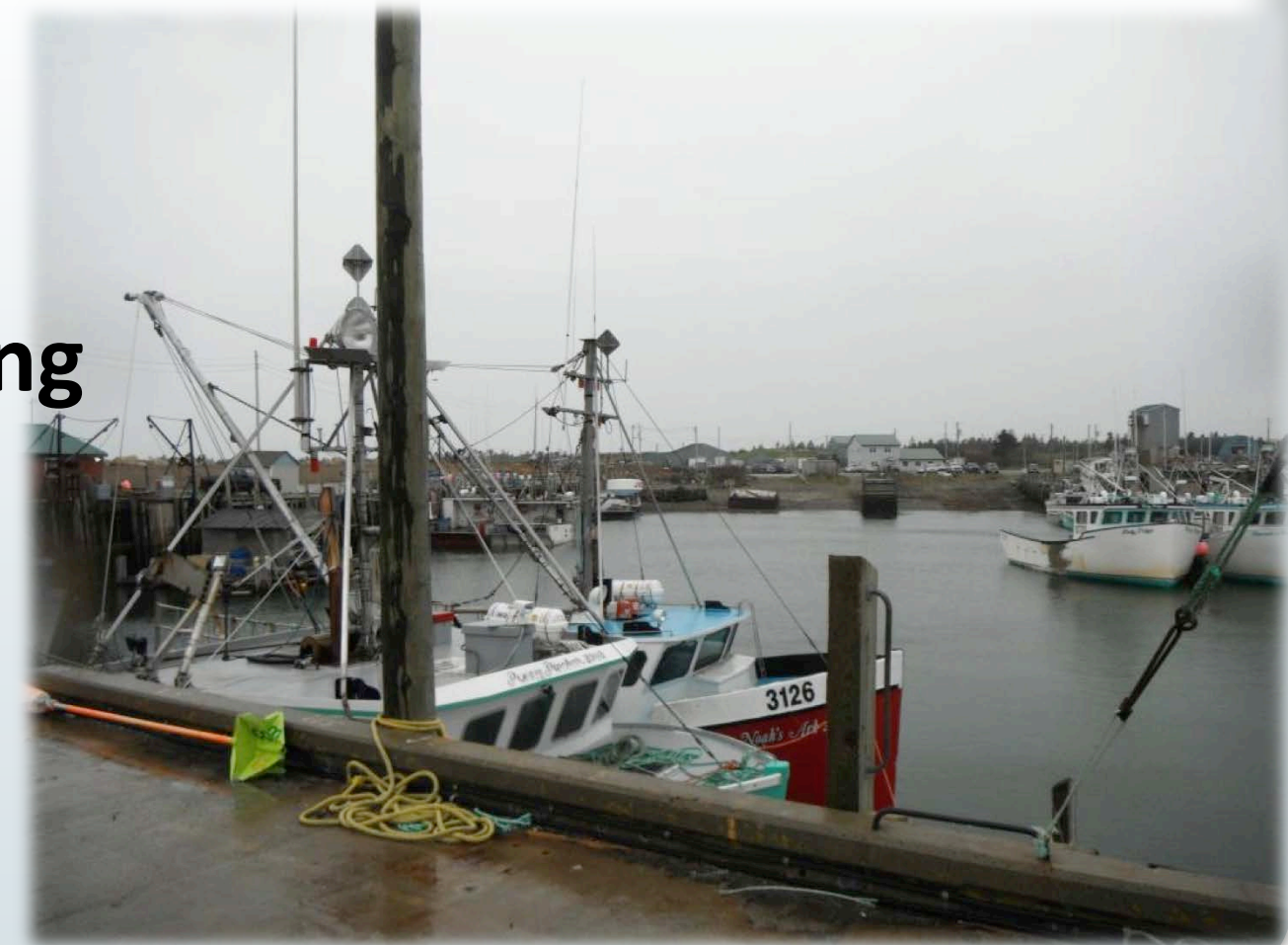


Reference: www.fisherynation.com

Background – Why is it required?

- Majority of harbours in Atlantic Canada serve commercial fishing and aquaculture industries
- Industrial harbours
- Tide, waves and current cause harbour infilling
- Dredging is required to maintain access
 - Capital projects and maintenance

→ *Dredging sustains local economy of many coastal communities*



Background - Challenges

- Dredging is essential for the maintenance of harbours
- Challenges:
 - Dredging projects are very expensive
 - \$10,000's to >\$1 Million
 - Costly and complex
 - Contractors can be difficult to find
 - Disposal options are hard to approve

Background - Environmental

- Environmental and benthic conditions must be assessed
- Sediments are sampled and analyzed for a large suite of chemicals → *disposal options determined based on results*

Identify
Dredging
Need

Define Dredge
Area / Volume

Complete
MSSP / UBHS

Assess
Results vs
Criteria

Identify
Disposal
Option

MSSP Analytical Program

Analytical Parameters	
PAHs	SAR and Electrical Conductivity
TPH / BTEX	Tributyl Tin
Total PCBs	Glycols and VOCs
Metals	Leachable Metals (SPLP & TCLP)
Total Cyanide	Leachable PAHs (SPLP & TCLP)
PCP	Grain Size
Dioxins and Furans	Carbon Content

Common Contaminants of Concern

- PAHs;
- Metals;
- PHCs;
- PCDD/Fs;
- Other physical/chemical contaminants;
- Other organic contaminants; and,
- If inland, SALT



PAHs, Metals & PHCs →
Account for 86% of
Contamination
Encountered

Reference: FCSI Program

PAHs & Metals →
Substances Potentially
Considered as Background
Occurrences

Reference: NSE Contaminated Sites Ministerial Protocols

Sediment Characterization - COCs

- **PAHs**
 - Sources
 - Creosote timbers used to construct wharfs
 - Natural sources (e.g. forest fires)
 - Urban run-off
 - Leachate (SPLP and TCLP)
 - Leachate analysis completed on sediment with highest PAHs concentrations
 - Compared to applicable Groundwater, Surface Water & Landfill Guidelines
 - Exposure pathway assessment



Sediment Characterization - COCs

- **Metals**
 - Sources:
 - Naturally occurring minerals (dissolved form or suspended particulate)
 - Corrosion or acid dissolution from anthropogenic sources
 - Paints and pigments
 - Background vs. actual contamination
 - Background soils database for Atlantic Canada
 - Upstream Sources
 - Background sediment (where available)



Sediment Characterization - COCs

- **Petroleum Hydrocarbons and other COCs**
 - Sources:
 - Harbour activity and boat operation (re-fuelling / spills)
 - On-land spills and run-off from the site / wharf
 - Urban run-off
 - PHCs tend to be site specific, however other persistent COCs (dioxins/furans, PCBs, older pesticides etc) may have Regional i.e., not site-specific sources



Reference: <http://thechronicleherald.ca>

Common Contaminants of Concern

- **Salt** does not mix well with inland soils/plants or potable wells
 - Salinity
 - Sodicity (SAR)
 - Conductance (EC)



Reference: <https://www.nps.gov/deva/index.htm>

Challenges

- Where does the sediment come from?
- Where does the “impact” come from?
- Is it contamination?
- Is it background?
 - Metals
 - PAHs



Challenges

- **Determining the source**
 - Point source vs non-point source → is site cleanup required?
- **Determining disposal options**
 - Are previous ones still available?
 - On-site – is there room?
 - Off-site cost
 - Approval (municipal, provincial, federal)

Challenges

- **Perception**
 - It's contaminated! (sort of)
 - How bad is salt?
 - Is it safe?
 - But it has been done before without issue...



Typical Disposal Options

Disposal at Sea

- Side casting
- Open water disposal



Reference: US EPA

Beneficial Use

- Construction aggregates
- Beach nourishment
- Land creation

Disposal on Land

- Federal property
- Private property
- Landfill
- Soil Treatment Facility

Typical Disposal Options

Disposal at Sea

- *CEPA Disposal at Sea Regulations* (**Environment Canada**)
 - Cadmium, Mercury, Total PAHs, Total PCBs guidelines
- Approval process
 - DAS Permit required
 - Disposal area must be vetted and approved



Typical Disposal Options

- Disposal on Land
 - Federal property
 - Private property
 - **Meet Provincial and Federal guidelines**
 - **Measures to mitigate risks to receptors**



Former dredged sediment disposal area on private property

Typical Disposal Options

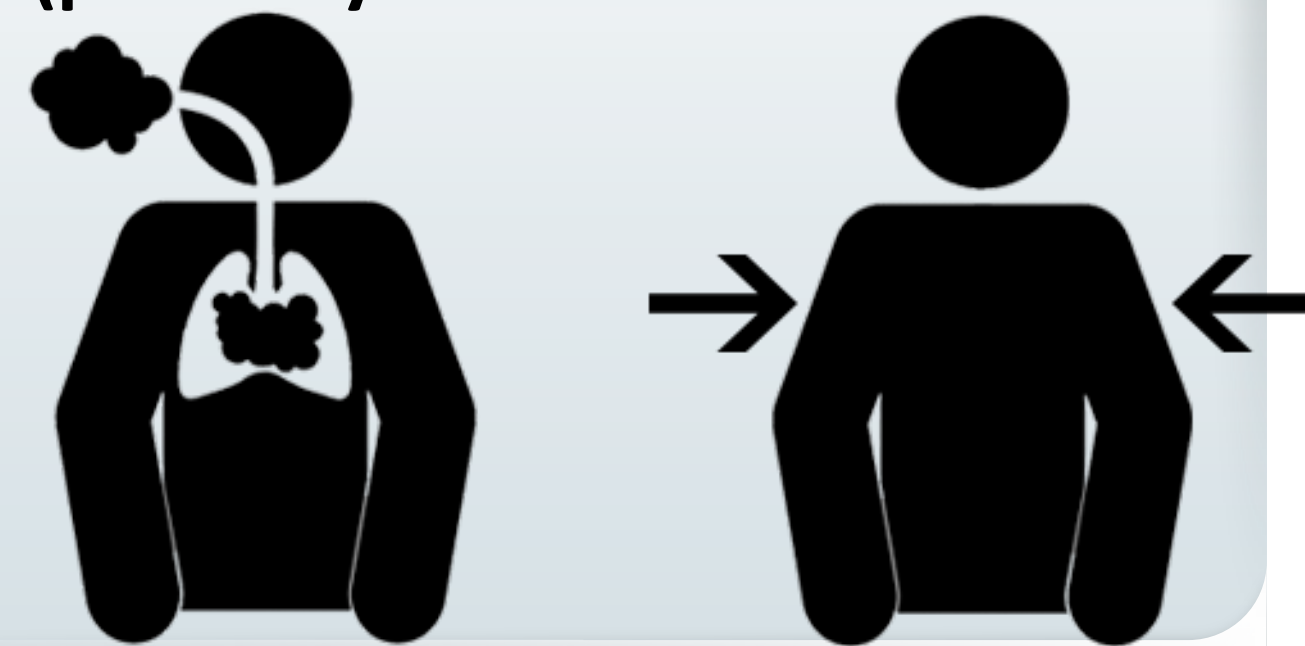
- Disposal on Land
 - Private property
 - **Applicable Guidance Document:**
 - *New Brunswick Guideline for Siting and Operation of a Dredging Material Disposal Site on Land (NBDELG, September 2011)*
 - » *Set-back distances*
 - » *Preference given to disposal sites located within saltwater intrusion zones*
 - » *Measures to reduce erosion and surface water runoff*

Typical Disposal Options

- Disposal on Land
 - Landfill
 - Landfill guidelines
 - Typically the second highest cost option
 - Soil Treatment Facility
 - Typically the highest cost option – only considered for highly impacted sediments

Measures to Mitigate Risks

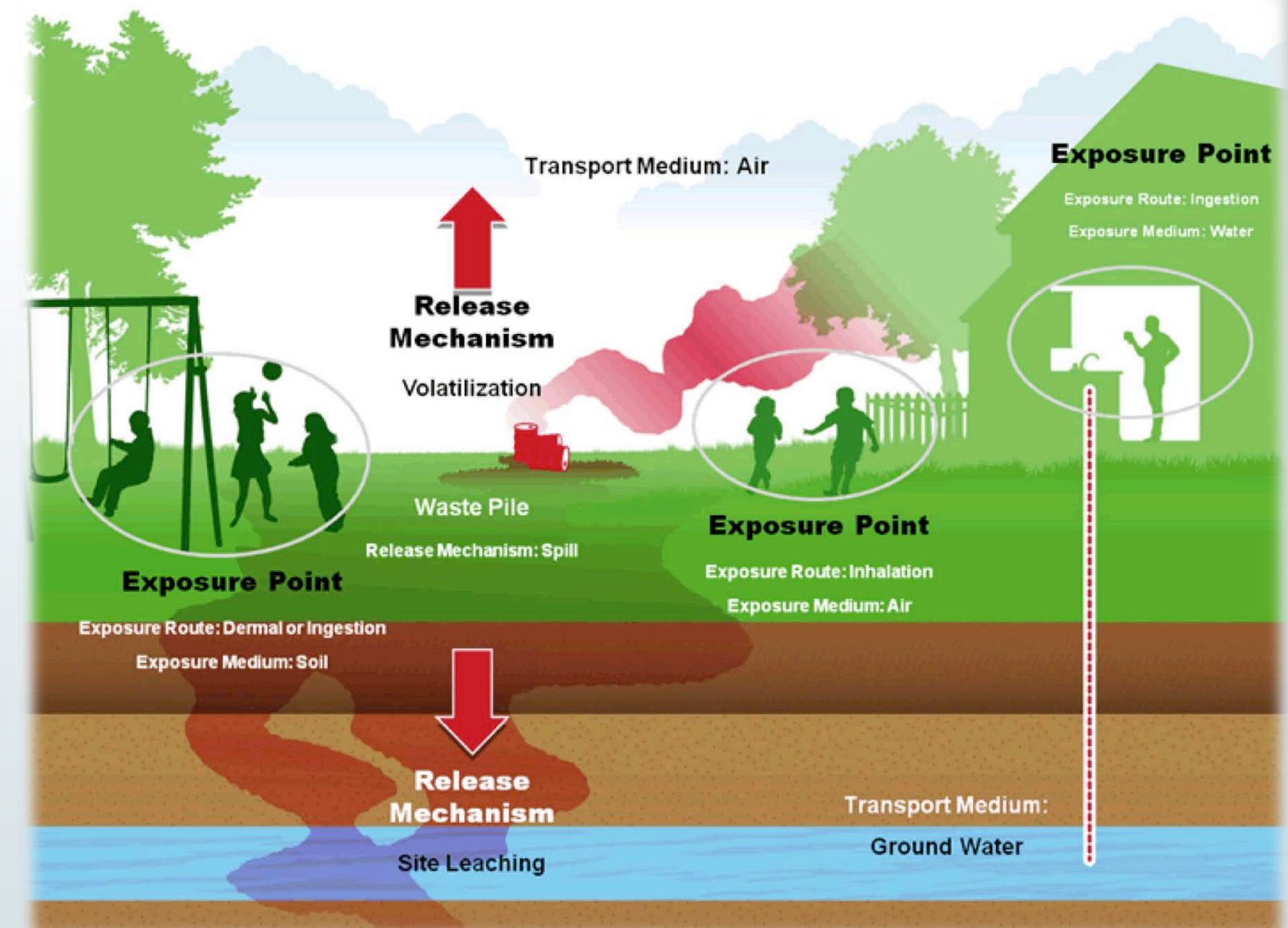
- Soil Contact
 - Pathway mitigation rarely required for contact or inhalation
 - **Mitigation Measures:**
 - Dredged sediment is typically bermed and capped (primarily for runoff control)
 - Fence area to eliminate ecological contact
 - Required setback distances
- *Pathway is eliminated once capped*



Reference: US EPA

Measures to Mitigate Risks

- Soil Leaching to Water and Run-off
 - Leachate results used to screen
 - Freshwater:
 - SALT is primary concern
 - Marine and Freshwater:
 - Sediment run-off concerns
 - **Mitigation Measures:**
 - Berm and cap dredged sediment
 - Add calcium amendment for SAR
 - Required setback distances

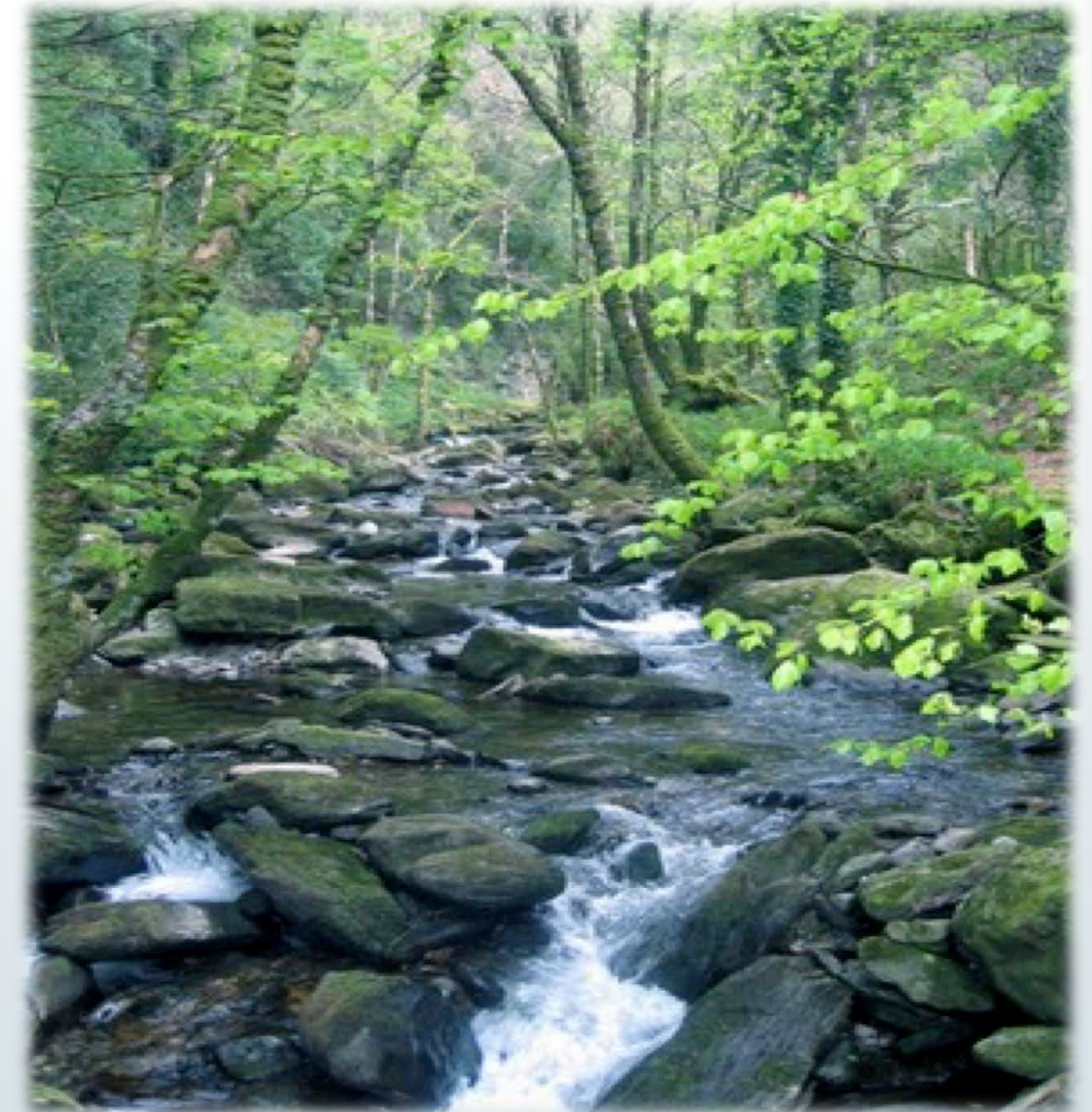


Reference: US EPA

Measures to Mitigate Risks

- Surface Water Pathway

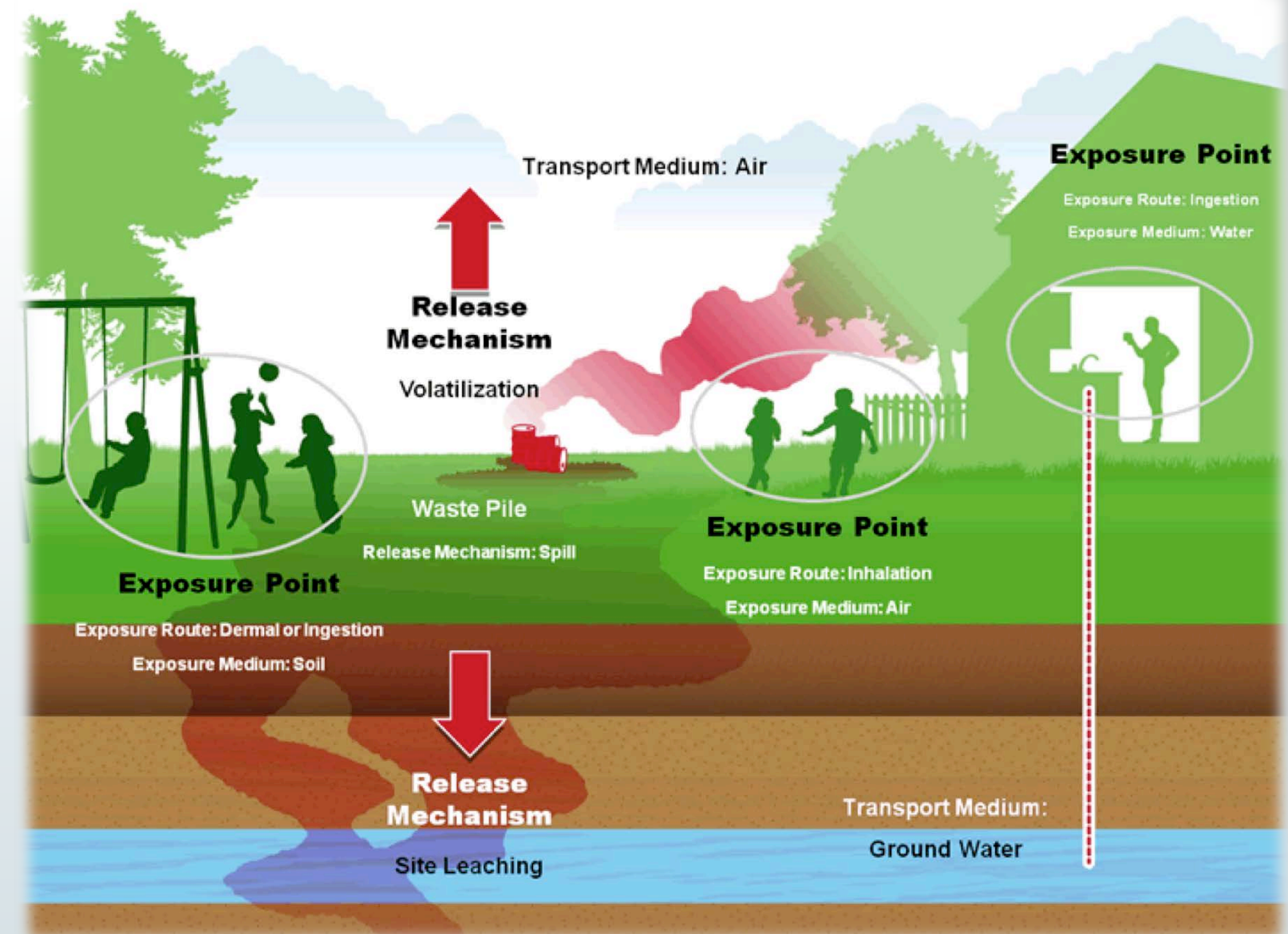
- Sediment run-off
- Chemical leaching and run-off
- SALT run-off
- **Mitigation Measures:**
 - Berm and cap dredged sediment
 - Add calcium amendment for SAR
 - Required setback distances



Ref: <http://beta.asoundstrategy.com/sitemaster/userUploads/site300/stream>

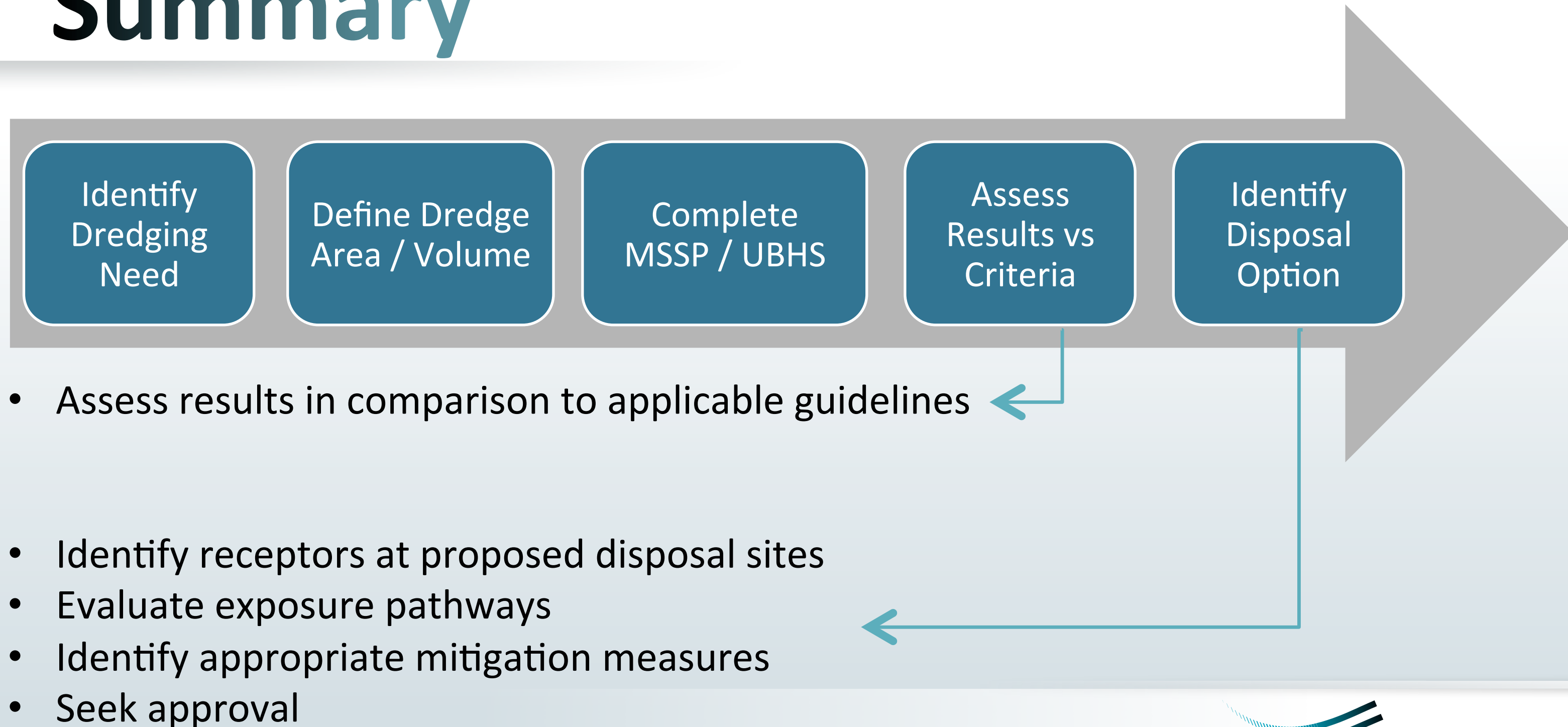
Measures to Mitigate Risks

- Groundwater Pathway
 - Leachate results used to screen
 - Is the proposed disposal site potable?
 - Yes: place material topographically downgradient from well in accordance with appropriate setback distances
 - No: consider off-site potability



Reference: US EPA

Summary



Thank-you!

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